

Appendices





Chapter 3

Vegetation Communities

Appendices



Appendix A3-1. Vegetation transect dGPS coordinates

Appendix A3-1. Vegetation monitoring transect GPS coordinates (UTM, Zone 11, Meters).

STATION	EASTING	NORTHING
Station 1, Transect 1	471982	3661605
Station 1, Transect 2	471987	3661592
Station 1, Transect 3	472000	3661571
Station 1, Transect 4	472004	3661556
Station 2, Transect 1	471093	3661231
Station 2, Transect 2	471132	3661206
Station 2, Transect 3	471158	3661188
Station 3, Transect 1	471143	3660604
Station 3, Transect 2	471140	3660621
Station 4, Transect 1	473315	3661024
Station 4, Transect 2	473329	3661054
Station 4, Transect 3	473339	3661073
Station 5, Transect 1	474666	3661662
Station 5, Transect 2	474653	3661639
Station 5, Transect 3	474602	3661546
Station 5, Transect 4	474547	3661446
Station 6, Transect 1	473732	3661485
Station 6, Transect 2	473745	3661476
Station 6, Transect 3	473761	3661460
Station 7, Transect 1	470993	3661187
Station 7, Transect 2	470987	3661200
Station 7, Transect 3	470973	3661240
Station 8, Transect 1	454580	3661199
Station 8, Transect 2	474569	3651320
Station 8, Transect 3	474613	3661178

Appendix A3-2. Total organic carbon in sediment from vegetation transects

Appendix A3-2. Total organic carbon (TOC) content (mg/kg) of sediment from vegetation transects (1997-2006).

October 1997								
Station	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
T 1	19000	5830	8280	9280	6280	1620	10500	9320
T 2	25800	16100	610	14900	241	2120	4850	3321
T 3	6160	2680		11500	10700	9150	9630	11100
T 4	7600				5850			
October 1998								
Station	Sta 1	Sta 2	Sta 3	Sta 4	Sta 5	Sta 6	Sta 7	Sta 8
T 1	14500	18700	16400	6210	9440	7540	15000	2610
T 2		15100	346	9870	326	1730	5660	14300
T 3	4860	177		11400	14900	7860	3350	13300
T 4	5710							
September 1999								
Station	Sta 1	Sta 2	Sta 3	Sta 4	Sta 5	Sta 6	Sta 7	Sta 8
T 1	19000	23700	39400	25200	12900	24300	1500	4000
T 2	20700	13800	1500	15300	2700	6600	5300	14000
T 3	20300	1000		17300	30100	8500	1000	16200
T 4	9100				17600			
September 2001								
Station	Sta 1	Sta 2	Sta 3	Sta 4	Sta 5	Sta 6	Sta 7	Sta 8
T 1	33600	4400	46000	11200	6300	5900	84500	6600
T 2	10300	5100	1900	35900	8800	1300	1000	13400
T 3	12600	900		36600	64900	2500	6100	75200
T 4	4800				10200			
October 2006								
Station	Sta 1	Sta 2	Sta 3	Sta 4	Sta 5	Sta 6	Sta 7	Sta 8
T 1	13000	33000	45000	35000	14000	69000	700	
T 2	18000	23000	2400	13000	1000	41000		18000
T 3	13000	35000		13000	27000	15000	4000	15000
T 4	7500				18000			

Appendix A3-3. Grain size analysis from vegetation monitoring transects (1997-2006)

Appendix A3-3. Grain size analysis from vegetation monitoring transects (September 1997).

Station	Transect	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1 East Basin	1	0.0%	0.0%	0.9%	1.2%	2.6%	3.0%	0.9%	1.5%	89.9%
	2	0.0%	0.0%	0.3%	0.4%	0.3%	0.2%	2.0%	6.1%	90.7%
	3	0.7%	0.0%	0.1%	1.0%	1.5%	2.5%	10.2%	0.0%	83.9%
	4	0.0%	0.3%	0.1%	0.1%	1.1%	3.3%	39.6%	12.9%	42.6%
2 Central Basin	1	0.0%	0.0%	0.9%	1.2%	16.1%	36.3%	24.5%	0.0%	21.0%
	2	0.0%	1.5%	4.7%	5.9%	16.2%	30.2%	26.1%	0.0%	15.4%
	3	0.0%	0.0%	0.1%	0.4%	14.0%	39.4%	39.0%	0.0%	7.0%
3 West	1	0.0%	0.4%	1.6%	4.2%	16.8%	33.8%	28.5%	0.0%	14.7%
	2	0.0%	0.3%	1.2%	2.3%	12.3%	36.5%	40.2%	0.0%	7.3%
4 East Basin	1	1.6%	1.3%	2.1%	5.8%	19.4%	16.5%	19.5%	0.0%	33.7%
	2	0.0%	1.4%	4.8%	0.2%	0.5%	2.6%	1.3%	0.0%	89.2%
	3	0.0%	0.9%	2.4%	5.7%	6.5%	4.6%	5.8%	0.0%	74.2%
5 East Basin	1	4.7%	1.2%	2.2%	5.1%	17.4%	20.0%	32.2%	0.0%	16.6%
	2	4.9%	2.4%	3.6%	5.9%	15.4%	20.5%	31.1%	0.0%	16.3%
	3	0.0%	0.0%	0.5%	0.2%	1.6%	1.0%	1.2%	0.0%	95.6%
	4	0.0%	0.0%	0.1%	0.3%	1.7%	1.2%	2.4%	3.7%	90.6%
6 East Basin	1	0.0%	0.8%	2.6%	11.0%	31.6%	22.1%	19.9%	0.0%	12.0%
	2	0.0%	0.3%	1.5%	7.8%	41.4%	22.5%	15.1%	0.0%	11.4%
	3	0.1%	0.1%	0.6%	1.3%	18.2%	33.1%	20.9%	0.0%	25.7%
7 West Basin	1	0.0%	9.1%	0.3%	0.5%	2.0%	7.7%	15.9%	0.0%	64.4%
	2	0.0%	0.5%	3.3%	4.2%	6.4%	16.0%	15.2%	0.0%	54.4%
	3	0.0%	0.1%	1.7%	8.4%	41.6%	21.2%	13.5%	0.0%	13.5%
8 East Basin	1	0.0%	0.1%	0.1%	0.5%	5.8%	23.6%	29.5%	0.0%	40.4%
	2	0.0%	0.0%	0.3%	0.3%	0.7%	0.7%	1.4%	0.0%	96.7%
	3	0.0%	0.0%	0.3%	0.7%	2.7%	2.1%	3.7%	1.3%	89.2%

Appendix A3-3. Grain size analysis from vegetation monitoring transects (October 1998).

		SAND						SILT CLAY		
Station	Transect	Coarse	Medium		Fine					
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
1 East Basin	1	0.0%	2.4%	1.7%	7.8%	12.1%	11.9%	16.4%	9.0%	38.5%
	2	0.0%	2.0%	1.8%	1.5%	12.3%	7.2%	13.7%	8.4%	53.1%
	3	0.0%	0.2%	1.1%	0.9%	4.0%	5.8%	17.7%	23.9%	46.3%
	4	0.0%	0.1%	0.3%	0.2%	1.0%	2.2%	29.9%	39.3%	26.9%
2 Central Basin	1	0.0%	5.7%	4.5%	3.8%	7.9%	13.3%	14.3%	6.9%	43.8%
	2	0.0%	1.3%	0.7%	2.8%	13.1%	30.9%	27.0%	5.9%	18.4%
	3	0.0%	0.0%	0.1%	0.6%	26.8%	35.8%	29.8%	4.2%	2.6%
3 West	1	0.0%	0.8%	1.7%	4.3%	17.8%	30.8%	28.3%	7.5%	8.9%
	2	0.0%	0.8%	1.1%	2.4%	9.2%	34.4%	40.0%	11.4%	0.7%
4 East Basin	1	0.0%	4.2%	2.6%	7.0%	24.0%	15.8%	19.2%	8.6%	18.6%
	2	0.0%	1.0%	0.7%	0.9%	3.0%	5.2%	9.1%	7.8%	72.2%
	3	0.0%	1.1%	0.5%	0.9%	1.9%	1.3%	2.3%	0.3%	91.6%
5 East Basin	1	0.0%	1.4%	1.1%	2.8%	13.2%	22.6%	34.9%	15.2%	8.7%
	2	0.0%	3.2%	1.8%	4.7%	17.0%	18.4%	31.2%	12.0%	11.8%
	3	0.0%	0.0%	0.2%	0.4%	0.8%	0.8%	2.2%	1.6%	93.9%
	4	0.0%	0.0%	0.7%	0.6%	0.1%	0.7%	1.1%	0.5%	96.4%
6 East Basin	1	0.0%	1.2%	1.9%	5.1%	23.1%	25.0%	28.0%	7.8%	8.0%
	2	0.0%	0.6%	1.8%	6.7%	30.7%	25.2%	23.3%	10.2%	1.6%
	3	0.0%	1.6%	1.1%	2.7%	18.4%	21.4%	26.6%	9.0%	19.0%
7 West Basin	1	0.0%	0.0%	0.6%	2.1%	14.9%	18.2%	8.4%	1.8%	54.1%
	2	0.0%	1.5%	1.6%	2.4%	15.4%	29.6%	21.7%	8.5%	19.3%
	3	0.0%	4.3%	7.7%	19.1%	37.0%	15.0%	7.9%	3.9%	4.9%
8 East Basin	1	0.0%	0.3%	0.3%	0.6%	4.6%	11.7%	15.3%	4.7%	62.5%
	2	0.0%	0.0%	1.5%	3.1%	11.0%	14.1%	11.1%	4.2%	54.9%
	3	0.0%	0.0%	0.7%	1.0%	3.3%	3.2%	6.2%	2.7%	83.0%

Appendix A3-3. Grain size analysis from vegetation monitoring transects (September 1999).
 (September 1999)

Station	Transect	SAND								SILT
		Coarse	Medium			Fine			CLAY	
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1 East Basin	1	0.5%	1.0%	0.5%	2.0%	5.9%	11.3%	24.1%	8.4%	46.3%
	2	5.1%	0.5%	0.5%	0.5%	0.5%	0.9%	2.8%	0.5%	88.8%
	3	0.9%	0.9%	2.8%	0.9%	1.9%	3.8%	13.2%	14.2%	61.3%
	4	0.0%	0.5%	0.5%	0.5%	2.6%	2.6%	47.7%	11.4%	34.2%
2 Central Basin	1	4.2%	4.6%	0.8%	2.9%	19.2%	13.8%	13.8%	1.3%	39.3%
	2	1.0%	3.9%	2.0%	2.4%	9.3%	7.8%	6.8%	2.4%	64.4%
	3	0.0%	0.3%	0.3%	19.6%	38.3%	26.8%	12.3%	1.8%	0.6%
3 West Basin	1	18.8%	1.6%	0.9%	6.3%	11.8%	0.4%	8.6%	16.5%	35.3%
	2	0.0%	0.5%	0.9%	4.2%	20.8%	31.1%	31.6%	6.4%	4.5%
4 East Basin	1	0.0%	1.8%	3.0%	11.1%	19.5%	18.3%	16.5%	6.5%	23.3%
	2	0.0%	0.0%	1.6%	1.6%	1.6%	1.6%	3.3%	3.3%	86.9%
	3	2.6%	2.1%	1.0%	1.0%	3.1%	1.6%	2.6%	0.5%	85.3%
5 East Basin	1	1.3%	3.2%	1.3%	3.2%	11.8%	12.0%	22.1%	27.7%	17.4%
	2	0.0%	1.8%	1.2%	2.4%	9.9%	16.8%	27.9%	12.0%	27.9%
	3	4.0%	1.2%	0.4%	2.4%	0.0%	0.8%	1.2%	0.4%	89.5%
	4	0.0%	0.5%	0.5%	0.5%	1.0%	3.0%	1.0%	2.0%	91.5%
6 East Basin	1	0.8%	2.8%	2.8%	9.2%	28.4%	15.6%	20.8%	4.0%	15.6%
	2	5.2%	0.6%	0.9%	15.2%	39.1%	16.9%	11.1%	1.2%	9.9%
	3	0.2%	1.9%	1.7%	5.9%	26.0%	16.1%	16.4%	5.7%	26.2%
7 West Basin	1	0.0%	0.3%	0.3%	1.1%	34.0%	33.5%	27.7%	3.2%	0.0%
	2	0.0%	0.2%	0.2%	1.0%	20.5%	11.2%	11.4%	2.4%	53.1%
	3	0.0%	0.3%	0.3%	1.3%	10.1%	31.5%	52.7%	3.7%	0.0%
8 East Basin	1	0.0%	0.5%	0.5%	0.5%	2.7%	8.2%	21.4%	9.1%	57.3%
	2	0.0%	1.0%	1.0%	1.4%	2.9%	2.9%	3.4%	0.5%	87.0%
	3	0.0%	0.0%	0.6%	1.2%	1.2%	1.2%	1.2%	1.2%	93.6%

Appendix A3-3. Grain size analysis from vegetation monitoring transects (September 2001).

Station	Transect	SAND								SILT CLAY	
		Coarse		Medium			Fine				
		U.S. Standard Sieve Size									
		10	16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)											
1	1	15.8%	0.0%	5.7%	0.4%	0.4%	0.9%	1.8%	1.3%	0.4%	73.2%
	2	4.4%	0.0%	7.9%	0.4%	0.4%	0.9%	1.3%	3.5%	3.5%	77.6%
	3	2.7%	0.0%	2.0%	0.7%	4.7%	2.7%	1.3%	3.3%	1.3%	81.3%
	4	0.0%	0.0%	0.5%	0.5%	0.0%	0.9%	3.3%	42.2%	18.5%	34.1%
2	1	2.2%	0.0%	1.3%	0.9%	0.4%	0.4%	5.3%	8.0%	3.6%	77.8%
	2	2.3%	0.0%	5.4%	0.8%	1.2%	4.6%	3.8%	5.8%	1.9%	74.2%
	3	0.3%	0.0%	0.7%	0.7%	3.0%	44.9%	36.5%	12.6%	1.3%	0.0%
3	1	9.9%	0.0%	5.0%	1.9%	3.1%	6.2%	6.8%	14.3%	1.2%	51.6%
	2	0.6%	0.0%	2.0%	3.1%	5.1%	28.3%	33.4%	23.5%	2.8%	1.1%
4	1	10.3%	0.0%	3.4%	2.8%	9.7%	18.6%	15.2%	17.9%	6.2%	15.9%
	2	0.0%	0.0%	3.7%	1.2%	1.2%	1.9%	3.1%	6.8%	5.6%	76.4%
	3	0.0%	0.0%	4.7%	1.3%	1.3%	0.0%	1.3%	4.0%	4.7%	82.6%
5	1	4.9%	0.0%	3.3%	1.6%	2.5%	1.6%	21.3%	36.9%	15.6%	12.3%
	2	3.4%	0.0%	3.4%	1.7%	2.3%	7.9%	14.7%	23.2%	10.7%	32.8%
	3	32.4%	0.0%	2.9%	0.8%	0.4%	0.4%	0.8%	2.9%	1.2%	58.2%
	4	1.7%	0.0%	1.2%	2.3%	1.2%	1.2%	1.2%	4.0%	5.2%	82.1%
6	1	22.0%	0.0%	3.0%	3.5%	7.5%	25.5%	13.5%	15.5%	3.0%	6.5%
	2	0.9%	0.0%	5.2%	2.3%	14.1%	35.7%	22.5%	12.2%	2.3%	4.7%
	3	0.5%	0.0%	1.0%	0.5%	1.0%	14.5%	20.2%	32.6%	6.2%	23.3%
7	1	0.6%	0.0%	2.2%	3.7%	23.0%	46.3%	18.3%	4.5%	0.3%	1.1%
	2	0.3%	0.0%	0.6%	0.6%	4.4%	27.0%	41.4%	15.7%	1.3%	8.8%
	3	0.5%	0.0%	0.5%	0.5%	0.5%	8.0%	26.4%	34.4%	7.5%	21.7%
8	1	0.0%	0.0%	0.5%	1.5%	1.5%	12.9%	3.5%	11.9%	9.4%	58.9%
	2	0.8%	0.0%	0.8%	0.8%	2.0%	1.6%	3.2%	6.1%	3.6%	81.0%
	3	0.8%	0.0%	3.1%	1.2%	0.4%	1.6%	0.8%	3.1%	1.6%	87.5%

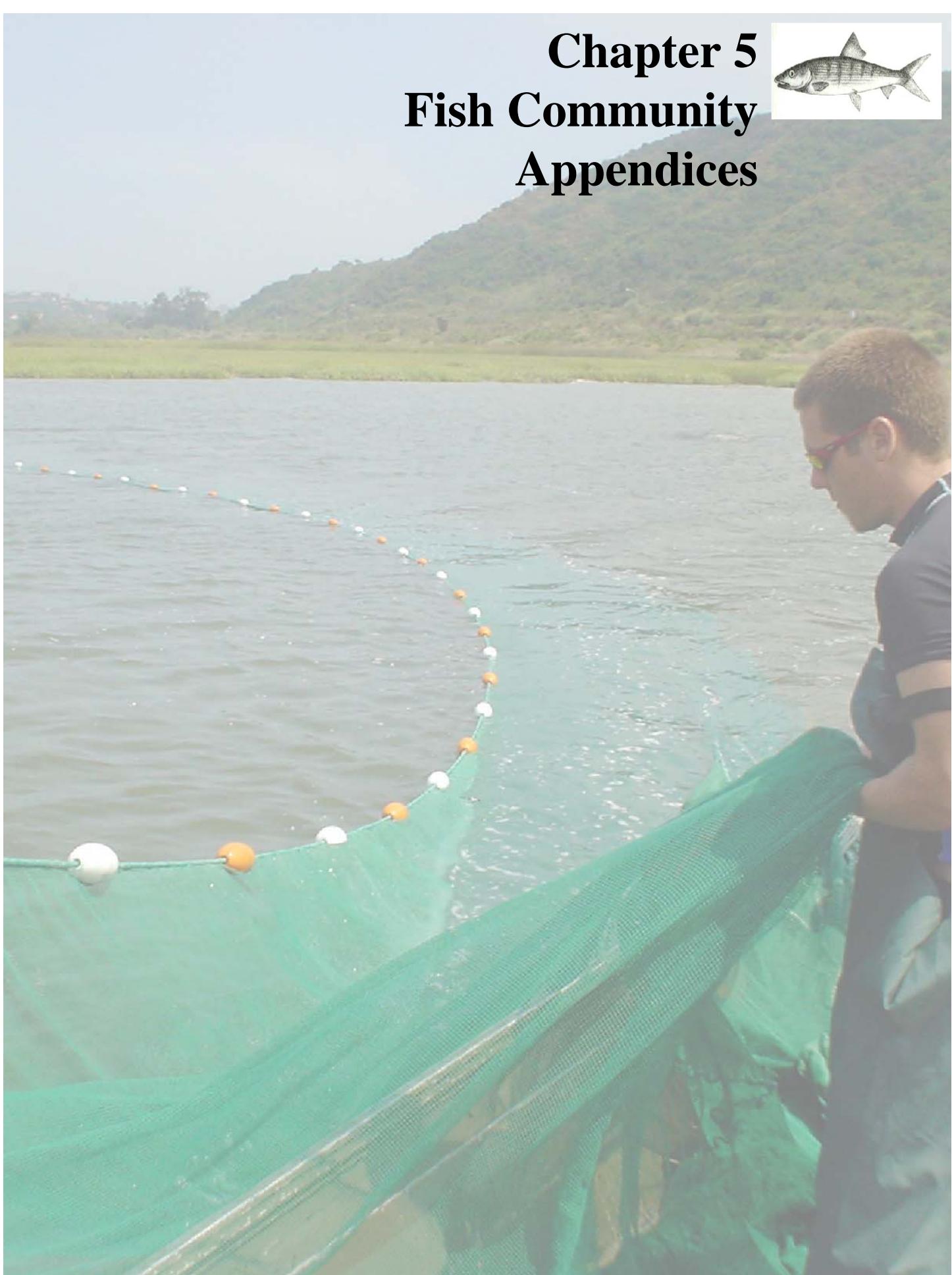
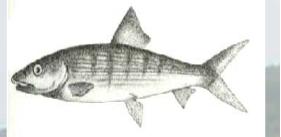
Appendix A3-3. Grain size analysis from vegetation monitoring transects (September 2006).

		Gravel	SAND									SILT or CLAY	
		Fine	Coarse	Medium				Fine					
		U.S. Standard Sieve Size											
		4	10	16	20	30	40	60	80	140	200	Pan	
Station	Transect	Weight retained (% of total sample)											
1 East Basin	1	0.0%	0.3%	0.2%	0.2%	0.8%	1.8%	9.8%	10.3%	10.1%	3.1%	63.7%	
	2	6.6%	4.5%	3.0%	85.0%	1.7%	2.6%	5.3%	6.4%	9.1%	5.9%	54.1%	
	3	0.0%	3.6%	3.5%			1.4%	2.2%	2.5%	7.4%	5.5%	67.9%	
	4	13.4%	77.0%	26.0%	0.0%	0.0%	51.0%	1.5%	4.4%	22.6%	12.6%	44.0%	
2 Central Basin	1	31.8%	8.8%	4.2%	0.9%	-65.9%	72.4%	5.5%	5.5%	6.5%	2.8%	27.7%	
	2	6.5%	8.6%	2.2%	1.9%	1.5%	0.9%	11.7%	5.5%	8.2%	9.2%	42.8%	
	3												
3 West	1	17.9%	2.2%	1.0%	1.0%	1.7%	4.1%	22.3%	18.0%	14.3%	3.1%	14.3%	
	2	0.0%	1.6%	1.6%	1.9%	3.4%	6.2%	24.8%	27.2%	21.6%	2.9%	3.8%	
4 East Basin	1	7.1%	4.0%	1.7%	93.0%	2.2%	4.7%	17.2%	6.7%	8.8%	4.3%	42.3%	
	2	24.5%	3.2%	1.2%	0.4%	0.8%	-0.8%	6.0%	3.2%	6.8%	3.6%	51.0%	
	3	3.1%	1.7%	2.7%	0.9%	1.1%	1.5%	3.5%	2.1%	4.6%	0.6%	12.3%	
5 East Basin	1	3.8%	1.8%	1.3%	0.9%	1.3%	2.9%	13.1%	13.6%	34.2%	6.0%	21.1%	
	2	0.0%	2.1%	1.4%	1.4%	4.1%	9.0%	28.0%	19.6%	25.1%	4.4%	4.9%	
	3	0.0%	5.7%	2.7%	0.4%	0.4%	76.0%	1.9%	1.5%	4.6%	2.3%	50.6%	
	4	0.7%	18.0%	0.1%	0.0%	0.1%	0.1%	0.2%	13.0%	23.4%	15.6%	46.7%	
6 East Basin	1	31.0%	5.8%	3.8%	2.3%	5.6%	6.1%	13.5%	7.0%	8.5%	3.2%	13.3%	
	2	27.7%	4.8%	1.5%	0.9%	1.5%	3.3%	18.7%	8.7%	10.5%	3.9%	18.4%	
	3	1.4%	5.1%	3.4%	1.4%	2.4%	3.8%	5.8%	6.1%	10.9%	7.9%	51.9%	
7 West Basin	1	0.0%	0.0%	0.0%	0.0%	1.2%	4.4%	32.0%	30.3%	27.8%	4.3%	0.0%	
	2												
	3	0.0%	0.0%	0.0%	0.0%	0.0%	21.0%	5.6%	17.5%	64.5%	12.1%	0.0%	
8 East Basin	1												
	2	0.0%	0.0%	0.5%	0.3%	0.2%	0.5%	0.8%	0.9%	2.5%	3.0%	91.4%	
	3	0.0%	0.0%	1.2%	0.8%	1.0%	1.0%	2.0%	1.8%	3.5%	2.0%	86.8%	

Chapter 5

Fish Community

Appendices



Appendix A5-1. Fisheries sampling station dGPS coordinates

Appendix A5-1. Fisheries sampling station dGPS coordinates (UTM, Zone 11, Meters).

STATION	EASTING	NORTHING
Station 1, Onshore	474057	3661440
Station 1, Offshore Endpoint E	474128	3661358
Station 1, Offshore Endpoint W	473876	3661307
Station 2, Onshore	472885	3661357
Station 2, Offshore Endpoint E	473016	3661224
Station 2, Offshore Endpoint W	472760	3661192
Station 3, Onshore	472416	3661123
Station 3, Offshore Endpoint E	472541	3661235
Station 3, Offshore Endpoint W	472282	3661266
Station 4, Onshore*	471149	3661033
Station 4, Offshore Endpoint N*	471395	3661135
Station 4, Offshore Endpoint S*	471378	3660884
Station 5, Onshore	471043	3661147
Station 5, Offshore Endpoint N	471026	3660945
Station 5, Offshore Endpoint S	471116	3660710

*An explanation of the change in the location of Station 4 is included in Section 5.1 of this report.

Appendix A5-2. Post-restoration fisheries survey dates (1997 through 2006)

Appendix A5-2. Post-restoration fisheries survey dates (1997 through 2006).

PERIOD		SAMPLING DATE	SAMPLING GEAR
January 1997	Day	Jan 20,21,22,24,25 and Feb 3,4	SS, LS, OT, PS, BT, SE
	Night	Jan 21, and Feb 1,3,4,5,6,13	SS, LS, OT, PS, BT, SE
April 1997	Day	Apr 7,8,10,11	SS, LS, OT, PS, BT, SE
	Night	Apr 7,8,10,11	SS, LS, OT, PS, BT, SE
July 1997	Day	July 20,21,22,25,27	SS, LS, OT, PS, BT, SE
	Night	July 20,21,23,24	SS, LS, OT, PS, BT, SE
October 1997	Day	Oct 13,14,15,17	SS, LS, OT, PS, BT, SE
	Night	Oct 12,13,14,15,16	SS, LS, OT, PS, BT, SE
January 1998	Day	Jan 26,27,28,29	SS, LS, OT, PS, SE
April 1998	Day	Apr 6,7,13,14	SS, LS, OT, PS, SE
July 1998	Day	July 13,14,15	SS, LS, OT, PS, SE
October 1998	Day	Oct 2,5,6,7	SS, LS, OT, PS, SE
January 1999	Day	Jan 4,5,14,15	SS, LS, OT, PS, SE
April 1999	Day	Apr 5,6,7,14,15	SS, LS, OT, PS, SE
July 1999	Day	July 12,13,19,20	SS, LS, OT, PS, SE
	Night	July 13,21,22	LS, PS
October 1999	Day	Oct 11,12,13,20,21,22	SS, LS, OT, PS, SE
January 2001	Day	Jan 3,4,5,24,25	SS, LS, OT, PS, SE
April 2001	Day	Apr 5,6,11,12	SS, LS, OT, PS, SE
July 2001	Day	July 1,16,17,19,20	SS, LS, OT, PS, SE
	Night	July 22,23,24,25,27	SS, LS, PS, SE
October 2001	Day	Oct 17,18,24,25,26	SS, LS, OT, PS, SE
January 2003	Day	Jan 8,9	LS, PS
April 2003	Day	Apr 7,8	LS, PS
July 2003	Day	July 28,29	LS, PS

October 2003	Day	Oct 15,16	LS, PS
January 2005	Day	Jan 28,31	LS, PS
April 2005	Day	Apr 12,13	LS, PS
July 2005	Day	July 13,15	LS, PS
October 2005	Day	Oct 27,28	LS, PS
January 2006	Day	Jan 19,20	SS, LS, OT, PS, SE
April 2006	Day	Apr 17,27,28	SS, LS, OT, PS, SE
July 2006	Day	July 18,24,25,26,27,28	SS, LS, OT, PS, SE
	Night	July 24,25,31 and Oct 1	SS, LS, OT, PS, SE
October 2006	Day	Oct 17,18,24,25	SS, LS, OT, PS, SE

**Appendix A5-3. Fish counts and weights by species (1997 through 2006)
Sorted by station, gear type, and quarter. Day and night data separately**

Number of individuals and mass, with area sampled, by gear type, station, and sampling period

Large Seine, Sta. 1, Daytime	Jan-1997	April-1997	July-1997	Oct-1997	Jan-1998	April-1998	July-1998	Oct-1998	Jan-1999	April-1999	July-1999	Oct-1999	Jan-2001	April-2001	July-2001	Oct-2001	Jan-2003	April-2003	July-2003	Oct-2003	Jan-2005	April-2005	July-2005	Oct-2005	Jan-2006	April-2006	July-2006	Oct-2006																												
Area Sampled (m ²)	868	791	837	965	915	1057	884	1349	1187	1256	1166	1101	2568	1338	1548	1341	1103	1135	1736	915	1256	1099	930	791	1023	930																														
	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)																												
anchovy, unidentified juvenile																																																								
Arrow goby																																																								
Barred pipefish																																																								
Bay ray																																																								
Bay goby																																																								
Bay pipefish																																																								
Black croaker																																																								
Bonefish																																																								
California butterfly ray																																																								
California corbina																																																								
California grunion																																																								
California halfbeak																																																								
California halibut																																																								
California killifish																																																								
Cheekspot goby	18	9.2	17	33	9	9.8	20	33.5	7	188.1	3	83	9	76	1	64	3	60.1	3	61	3	35.2	3	1704	1	200	4	180	2	550																										
CIQ goby																																																								
Deepbody anchovy	2	9	60	67.8	723	367.5																																																		
Diamond turbot																																																								
Goby, unidentified juvenile																																																								
Gray smoothhound																																																								
Longjaw mudsucker																																																								
Northern anchovy																																																								
Pacific worm eel																																																								
Pipefish, unidentified spp.																																																								
Round stingray																																																								
Salema																																																								
Shadow goby																																																								
Shiner surfperch																																																								
Shovelnose guitarfish																																																								
Slough anchovy																																																								
Spotfin croaker																																																								
Spotted sand bass																																																								
Staghorn sculpin	2	17																																																						
Striped mullet	10	46	18	25.9	79	259	30	113.5	1	1	16	4.8	4	122	4	247	1	72	5	1472	6	829	4	630.5	5	3125	8	5.2	1	89.3																										
Topsmelt																																																								
White seabass																																																								
Yellowfin croaker																																																								
Yellowfin goby	1	59	11	12.8																																																				
Total	21	77	124	340	757	408	142	333	125	501	77	201	119	2412	984	38255	45	774	963	3636	356	1174	560	1150	57	4626	438	5074	1006	23005	867	10023	153	4352	794	5598	355	11482	293	2117	108	135	118	1312	277	536	282	3446	97	159	104	4497	454	1500	293	502

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Otter Trawl, Sta 1, Daytime		Jan-1997		Apr-1997		July-1997		Oct-1997		Jan-1998		Apr-1998		July-1998		Oct-1998		Jan-1999		Apr-1999		July-1999		Oct-1999		Jan-2001		Apr-2001		July-2001		Oct-2001		Jan-2006		Apr-2006		July-2006		Oct-2006	
Area Sampled (m ²)		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402									
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)							
Arrow goby			1	0.2	4	2			43	5.7			2	0.1			20	3			47	3.4																			
Barred pipefish					1	0.5			19	10.4			2	1	1	0.5					1	22	1	1	63	6.8															
Barred sand bass							1	500	1	300			9	316	1	33			3	3975	1	400	2	1490			6	2.3													
Bat ray									1	1000			4	1280					1	600	1	3700			1	5500	3	2350			1	7500	1	550							
Bay pipefish																				1	700																				
California butterfly ray																																									
California corbina																																									
California halibut																																									
California killifish																																									
Cheekspot goby																																									
CIQ goby																																									
Croaker, unidentified juvenile																																									
Deepbody anchovy																																									
Diamond turbot	83	42.4	1	4	420	178.7	7	16	4	259	9	640	11	782	6	35	10	2.6	118	40	8	1108	1	42.2	31	188	2	61	3	105.4	13	655.9	14	340	1	2	2	275			
Goby, unidentified juvenile			2	12	6	118																																			
Longtail goby																																									
Northern anchovy																																									
Pacific worm eel																																									
Pipefish, unidentified spp.																																									
Queenfish																																									
Round stingray																																									
Sargo																																									
Shadow goby																																									
Slough anchovy																																									
Spotfin croaker																																									
Spotted sand bass																																									
Staghorn sculpin																																									
Topsmelt			1	9																																					
Yellowfin croaker			2	45																																					
Yellowfin goby																																									
Total	90	89	9	74	469	1475	42	1375	35	1119	20	1644	110	1397	226	1899	36	9725	10	1090	131	7158	131	9401	17	2045	88	9294	251	3800	133	732	5	2019	5	8000	55	2646	6	319	

Number of individuals and mass, with area sampled, by gear type, station, and sampling period

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 2, Daytime		Jan-1997		Apr-1997		July-1997		Oct-1997		Jan-1998		Apr-1998		July-1998		Oct-1998		Jan-1999		Apr-1999		July-1999		Oct-1999		Jan-2001		Apr-2001		July-2001		Oct-2001		Jan-2006		Apr-2006		July-2006		Oct-2006	
Area Sampled (m ²)		138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138								
species		Count (#)	Mass (g)																																						
Arrow goby																																									
Barred sand bass																																									
Bonefish																																									
California halibut		2	0.2	14	28	219	43.5	371	264.2	13	2.7	14	19.7	18	2.2	6	9.7	4	2.8	54	5	11	4.1	20	2.8	41	37.7	49	28.5	17	10	26	25.5	2	1	48	14.4	1	0.2		
California killifish			3	2.1	1	0.2	28	1.3		6	0.1	2	0.3			4	0.5	8	0.5	2	0.3	1	0.1	2	0.2			2	0.4			66	7.8								
Cheekspot goby																																									
CIO goby																																									
Deepbody anchovy																																									
Diamond turbot																																									
Round stingray																																									
Shadow goby																																									
Slough anchovy																																									
Spotted sand bass																																									
Staghorn sculpin																																									
Striped mullet																																									
Topsmelt																																									
Yellowfin goby			2	1.9																																					
Total		2	0	72	68	234	78	405	268	23	3	93	63	67	52	59	37	33	28	253	147	71	6	18	6	27	3	126	76	166	51	100	46	30	27	83	26	74	400	68	10

Otter Trawl, Sta 2, Daytime		Jan-1997		Apr-1997		July-1997		Oct-1997		Jan-1998		Apr-1998		July-1998		Oct-1998		Jan-1999		Apr-1999		July-1999		Oct-1999		Jan-2001		Apr-2001		July-2001		Oct-2001		Jan-2006		Apr-2006		July-2006		Oct-2006				
Area Sampled (m ²)		2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402										
species		Count (#)	Mass (g)																																									
Arrow goby																																												
Atherinid, unidentified juvenile																																												
Barred pipefish																																												
Barred sand bass																																												
Bat ray																																												
Bay blenny																																												
Bay pipefish																																												
Black croaker																																												
Black surfperch																																												
California butterfly ray																																												
California halibut		1	0.2	13	154	25	512	14	447	5	157	2	131	24	1441	14	1585	1	5.7	10	640	7	320	4	603	24	2648	1	900	1	200	1	14	1	2250	3	216	1	15					
California killifish																																												
California tonguefish																																												
Cheekspot goby		3	0.7																																									
CIO goby																																												
Deepbody anchovy		17	46	1	3.8	114	14.8	2	23	1	11	8	775	1	95	4	384	7	811	15	234	1	125	3	330	1	157.4	9	230	2	195	4	745	3	191									
Diamond turbot			1	340																																								
Goby, unidentified juvenile																																												
Kelp bass																																												
Pile surfperch																																												

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Large Seine, Sta 3, Daytime		Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2003	Apr-2003	July-2003	Oct-2003	Jan-2005	Apr-2005	July-2005	Oct-2005	Jan-2006	Apr-2006	July-2006	Oct-2006																											
Area Sampled (m ²)		884	1070	1132	1008	450	412	535	543	1008	791	928	1488	884	983	742	586	544	921	553	507	845	651	553	465	698	605	419																												
species		Count (#)	Mass (g)																																																					
Arrow goby																																																								
Atherinid, unidentified juvenile																																																								
Barred pipefish																																																								
Barred sand bass																																																								
Bat ray																																																								
Bay blenny																																																								
Bay pipefish																																																								
Bonefish																																																								
California halibut	1	3	4	36	9.7	18	15.3	30	61.5	107	157.5	8	20.4	17	154.8	3	147	109	153.2	3	5.3	10	203.8	8	14.4	2	4.1	5	3.9																											
California killifish																																																								
California needlefish																																																								
Cheekspot goby																																																								
ClQ goby																																																								
Deepbody anchovy																																																								
Diamond turbot																																																								
Dwarf surfperch																																																								
Giant kelpfish																																																								
Goby, unidentified juvenile																																																								
Gray smoothhound																																																								
Kelp bass																																																								
Northern anchovy																																																								
Pipefish, unidentified juvenile																																																								
Pipefish, unidentified spp.																																																								
Redtail surfperch																																																								
Round stingray																																																								
Sargo																																																								
Shadow goby																																																								
Shiner surfperch																																																								
Slough anchovy																																																								
Spotted sand bass																																																								
Staghorn sculpin																																																								
Striped kelpfish																																																								
Striped mullet	9	14.4	20	188.8	88	260.3	54	88.7	584	4939	78	596	3676	725.8	78	411.4	8	89.6	37	782	581	1243	371	968.9	79	0.7	4	68.7	139	442.4	131	420.7	78	219.2	139	280.9	96	136.6	1	2.3	37	227.4	113	5	12	19.1	12	10.9	88	1183	349	961.7	23	74.8		
Total	10	17	20	189	364	1858	83	123	588	4939	80	596	3760	1502	188	645	131	658	228	1122	773	2658	575	1127	103	217	91	927	185	1247	148	879	92	688	402	687	230	488	181	145	12	38	258	1456	279	147	19	29	36	105	136	1237	395	1077	58	97

Purse Seine, Sta 3, Daytime		Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2003	Apr-2003	July-2003	Oct-2003	Jan-2005	Apr-2005	July-2005	Oct-2005	Jan-2006	Apr-2006	July-2006	Oct-2006																				
Area Sampled (m ²)		1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040																	
species		Count (#)	Mass (g)																																														
Arrow goby		2	0.4																																														
Atherinid, unidentified juvenile																																																	
Barred pipefish																																																	
Barred sand bass																																																	
Barred surfperch		4	3742	16	6600																																												
Bat ray																																																	
Bay blenny																																																	
Bay pipefish																																																	
Black croaker																																																	
Black surfperch																																																	
Bonefish																																																	
Brown smoothhound																																																	
California corbina		4	68	502	345	1	1	3	1.1	9	4.2	1	447	1	0.6	20	18.1	5	322	1	171	1	124	7	1400	2	0.1	64	650.1	19	18.5	2	19.3	1	70	5	93	2	10.8	1	2.5	4	4.9						
California grunion				</																																													

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 3, Daytime	Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2006	Apr-2006	July-2006	Oct-2006		
Area Sampled (m ²)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138		
species	Count (#)	Mass (g)																				
Arrow goby			4	1.3					1	0.1			1	0.7		13	1.1	12	1.7			
Atherinid, unidentified juvenile									1	0.2			1	0.8		1	0.3	2	0.5		2	
Barred pipefish									1	0.2			1	0.1		1	0.5	1	0.2		0.1	
Barred sand bass																						
Bay blenny																						
Bay pipefish																						
Bonefish																						
California grunion																						
California halibut																						
California killifish																						
Cheeksot goby																						
CIQ goby																						
Deepbody anchovy																						
Diamond turbot	1	0.2	2	0.1																		
Goby, unidentified juvenile																						
Shadow goby																						
Staghorn sculpin																						
Striped mullet																						
Topsmelt	20	0.6	6	1.2	2	0.6	7	13.6	1	0.1	974	146.3	2	4.5	1	0.2						
Yellowfin goby																						
Total	21	1	12	3	91	42	90	48	221	67	6	0	980	177	58	26	51	31	23	16	55	23
																					9	

Otter Trawl, Sta 3, Daytime	Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2006	Apr-2006	July-2006	Oct-2006	
Area Sampled (m ²)	2498	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	2402	1601	801	2402	1601	
species	Count (#)	Mass (g)																			
Arrow goby																					
Barred pipefish																					
Barred sand bass																					
Bat ray																					
Bay blenny																					
Bay pipefish																					
California butterfly ray																					
California halibut	1	3.2	19	342.4	32	503	1	0.1	11	400.2	8	64.8	21	630	5	1094	4	1465	5	248	1
Cheeksot goby																					
Deepbody anchovy																					
Diamond turbot																					
Giant kelpfish																					
Goby, unidentified juvenile																					
Kelp bass																					
Queenfish																					
Pipefish, unidentified spp.																					
Round stingray																					
Sargo																					
Shiner surfperch																					
Slough anchovy																					
Spotted sand bass																					
Staghorn sculpin																					
Tops melt	1	14	5	140	2	131	1	38													
White seabass																					
Yellowfin croaker																					
Yellowfin goby																					
Grand Total	0	0	8	342	84	3188	105	5893	21	1593	42	3306	26	1814	31	1354	10	1784	7	1637	30

Square Encl., Sta 3, Daytime	Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2006	Apr-2006	July-2006	Oct-2006	
Area Sampled (m ²)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
species	Count (#)	Mass (g)																			
Arrow goby																					
Bay goby																					
Bay pipefish																					
California halibut																					
Cheeksot goby																					
CIQ goby																					
Diamond turbot																					
Goby, unidentified juvenile																					
Grand Total	0	0	2	0.3	1	0.2	15	46.3	4	0.5	1	0.1	6	0.2	0	0.0	0	0.0	0	0.0	1

Number of individuals and mass, with area sampled, by gear type, station, and sampling period

Large Seine, Sta. 4, Daytime	Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2003	Apr-2003	July-2003	Oct-2003	Jan-2005	Apr-2005	July-2005	Oct-2005	Jan-2006	Apr-2006	July-2006	Oct-2006																								
Area Sampled (#)	744	713	915	372	512	508	527	465	659	516	646	708	899	904	742	808	637	1035	765	722	915	744	698	708	698	698	605	682																								
species	Count (#)	Mass (g)																																																		
Arrow goby		5	2.3				2	3.4		2	0.4		1	1	6	1.7			201	32.98	5	0.9	4	0.8																												
Barred pipefish							1	0.5					3	0.6			16	20.3	2	0.7	1	0.1																														
Barred sand bass							2	15							1	110			10	54	4	53			30	4.8																										
Bat rudder																1	440							1	47.5	2	177	1	5.4	1	67																					
Bay blenny																													1	2.3																						
Bay goby																													2	16.3																						
Bay pipefish																														1	0.5																					
Black surfperch																															1	5.7																				
Blenny, unidentified juvenile																																																				
Blennioid																																																				
California grunion																																																				
California halibut	1	0.6	10	1	9	74	2	15		2	96	17	278.6		10	22.9		16	71.86	3	27.7	7	141.8	1	52.3																											
California killifish					1	4	12	8			1	1				8	16.8	140	391	16	6.3	292	657.1	851	2455	13	31.4	6	4.2																							
California needlefish																																																				
California scorpenid																																																				
Checkspot goby																																																				
CiQ goby			2	0.5	9	8	1	4			6	0.4	2	0.4	22	1.9		1	6																																	
Deepbody anchovy																																																				
Diamond turbot																																																				
Dwarf surfperch																																																				
Giant kelpfish																																																				
Goby, unidentified juvenile			2	0.4																																																
Kelp bass																																																				
Longtail goby																																																				
Northern anchovy																																																				
Opaleye																																																				
Pipefish, unidentified spp.																																																				
Round stingray																																																				
Shadow goby																																																				
Shiner surfperch																																																				
Slough anchovy																																																				
Spotted kelpfish																																																				
Spotted sand bass																																																				
Staghorn sculpin																																																				
Striped kelpfish																																																				
Striped mullet																																																				
Striped surfperch																																																				
Topsmelt	1	0.1	1554	2216	286	943.3	207	1575	6	0.1	14	4.8	222	1278	237	1042	145	408.5	170	60.6	617	1184	1757	2892	159	914.3	3906	1578	263	1017	203	590.3																				
Walleye surferch																																																				
White surferch																																																				
Yellowfin goby																																																				
Total	3	1	31	14	1576	2306	309	974	209	1575	42	130	44	442	1152	2716	283	1246	306	994	217	904	916	2048	2648	9599	516	2352	4132	2268	366	1124	706	1751	1090	983	198	777	57	2039	152	1560	2689	2375	294	2802	72	852	598	2696	106	95

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 4, Daytime	Jan-1997		Apr-1997		July-1997		Oct-1997		Jan-1998		Apr-1998		July-1998		Oct-1998		Jan-1999		Apr-1999		July-1999		Oct-1999		Jan-2001		Apr-2001		July-2001		Oct-2001		Jan-2006		Apr-2006		July-2006		Oct-2006	
Area Sampled (m ²)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138				
species	Count (#)	Mass (g)																																						
Arrow goby		1	0.4								6	1.2		2	0.8					1	0.5	7	1.2			2	0.3	88	7.7	102	9.4	12	1.1							
Barred pipefish																				2	0.3	1	0.4			4	1.4			2	0.1									
Bay goby		2	0.8																																					
Bay pipefish																																								
California halibut		1	0.3	1	2.7															4	4.1	9	0.5	5	17.6	1	0.2	9	11.1	15	3.3	55	27	7	0.2			2	0.2	
California killifish			6	17.8	16	10.4					1	7	7	8.6	6	9.9				157	103.3	161	318.6	202	254.5	57	176	9	5.4	6	1	3	4	1	0.1	4	13.7	17	14.9	
Cheekspot goby											44	3.8							9	1.65			2	0.5	7	1.9	1	0.3												
CIQ goby		2	1.3																																					
Diamond turbot		2	5																																					
Giant kelpfish																																								
Goby, unidentified juvenile																																								
Longnose puffer																																								
Longtail goby																																								
Sculpin, unidentified species																																								
Shadow goby																																								
Staghorn sculpin																																								
Striped kelpfish																																								
Striped mullet																																								
Topsmelt	4	0.9	185	40.9	11	16	15	0.2	10	0.4	1	0.2	119	480.6					30	0.3	18	8.2	50	29.1	2	2.8	2	3.5	485	144.5	131	64.3	1	0.1	4	0.2	202	28.7	21	14.1
Yellowfin goby											1	0.5								1	18.2																			
Total	0	0	12	9	192	61	27	26	20	13	77	31	11	13	125	491	16	7	43	4	199	212	219	350	219	270	166	197	656	212	171	68	6	5	71	24	208	43	136	38

Otter Trawl, Sta 4, Daytime	Jan-1997		Apr-1997		July-1997		Oct-1997		Jan-1998		Apr-1998		July-1998		Oct-1998		Jan-1999		Apr-1999		July-1999		Oct-1999		Jan-2001		Apr-2001		July-2001		Oct-2001		Jan-2006		Apr-2006		July-2006		Oct-2006	
	Area Sampled (m ²)		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402		2402									
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)								
Arrow goby					2	2.2																																		
Atherinid, unidentified juvenile																																								
Barred pipefish																																								
Barred sand bass																																								
Bat ray																																								
Bay blenny																																								
Bay pipefish																																								
California butterfly ray																																								
California halibut	1	750	2	6.4	1	9	11	252	3	40.4	8	465	1	3	4	65					1	130	1	28	5	30	4	28.7	33	1091	10	1003								
California tonguefish			1	1.6																																				
Cheekspot goby																																								
Diamond turbot			1	2	1	83	12	1223	3	355	9	1137	2	265	1	145					2	60	1	22	7	2895	2	460	2	61	1	41	1	52	6	469.1	15	3470	1	12
Dwarf surfperch																																								
Giant kelpfish																																								
Goby, unidentified juvenile			2	0.2																																				
Gray smoothhound																																								
Hornhead turbot																																								
Kelp bass																																								
Pile surfperch																																								
Round stingray																																								
Salema																																								
Shiner surfperch																																								
Spotted sand bass																																								
Spotted turbot																																								
Staghorn sculpin																																								
Striped kelpfish																																								
Total	3	750	7	126	14	97	29	2548	8	396	34	1962	6	418	18	671	7	1073	11	206	3	180	14	3656	100	1392	37	1953	75	3266	51	3032	8	1019	42	12365	7	2140	17	4124

Number of individuals and mass, with area sampled, by gear type, station, and sampling period

Large Seine, Sta 5, Daytime	Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2003	Apr-2003	July-2003	Oct-2003	Jan-2005	Apr-2005	July-2005	Oct-2005	Jan-2006	Apr-2006	July-2006	Oct-2006																												
Area Sampled (m ²)	1116	1736	1674	1023	1845	1442	1829	1271	2308	2266	2283	1852	2666	2362	2906	2496	2565	2353	3987	2930	3116	1612	2976	3480	3348	3147	2883	1871																												
species	Count (#)	Mass (g)																																																						
anchovy, unidentified juvenile																													1 0.5																											
Arrow goby																																																								
Barred pipelish																																																								
Barred sand bass																																																								
Bat ray																																																								
Bay blenny																																																								
Bay pipelish																																																								
Bonefish																																																								
California corbina																																																								
California grunion																																																								
California halibut																																																								
California killifish																																																								
California needlefish																																																								
Cheekspot goby																																																								
ClQ goby																																																								
Deepbody anchovy																																																								
Diamond turbot																																																								
Dwarf surfperch																																																								
Giant kelpfish																																																								
Halfmoon																																																								
Kelp bass																																																								
Opaleye																																																								
Queenfish																																																								
Round stingray																																																								
Shiner surfperch																																																								
Slough anchovy																																																								
Spotfin croaker																																																								
Spotted sand bass																																																								
Striped mullet																																																								
Threadfin shad																																																								
Topsmeat	119	748.2	230	834.4	1480	3209	304	1592	295	1134	251	523.6	149	740.4	437	2660	38	495.6	1	43	391	918.5	907	3425	435	1081	131	482.8	400	1042	137	392.3																								
Walleye surperch																																																								
White seabass																																																								
Yellowfin croaker																																																								
Yellowfin goby																																																								
Total	120	768	250	2697	1555	8415	327	4686	360	12609	493	3748	284	9573	591	10867	75	2867	198	12793	689	7447	1166	18185	560	21052	206	7818	661	5041	256	1093	73	7195	392	11570	453	11061	418	5994	888	9550	1452	9111	15824	5403	364	9522	279	14082	2042	56067	1129	14014	2100	24694

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 5, Daytime		Jan-1997		Apr-1997		July-1997		Oct-1997		Jan-1998		Apr-1998		July-1998		Oct-1998		Jan-1999		Apr-1999		July-1999		Oct-1999		Jan-2001		Apr-2001		July-2001		Oct-2001		Jan-2006		Apr-2006		July-2006		Oct-2006	
Area Sampled (m ²)		138		138		138		138		138		138		138		138		138		138		138		138		138		138		138		138									
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)									
Arrow goby																																									
Bay blenny																																									
California halibut																																									
California killifish	4	14	3	16	1	4	14	31	61	68.8	1	25	2	6.8	42	84.7	4	25.3	1	0.1	1	0.3	1	0.1	6	0.4	1	1													
CIQ goby																																									
Diamond turbot			3	7																																					
Staghorn sculpin																																									
Topsmelt	26	0.4	4	13.5		1	12	8	10																																
Yellowfin croaker																																									
Yellowfin goby																																									
Total	30	14	10	37	2	16	22	41	62	73	7	57	4	12	45	86	0	0	4	25	1	0	1	2	0	0	6	48	9	29	35	41	37	23	6	5	2	1	0	0	

Square Encl., Sta 5, Daytime	Jan-1997	Apr-1997	July-1997	Oct-1997	Jan-1998	Apr-1998	July-1998	Oct-1998	Jan-1999	Apr-1999	July-1999	Oct-1999	Jan-2001	Apr-2001	July-2001	Oct-2001	Jan-2006	Apr-2006	July-2006	Oct-2006
Area Sampled (m ²)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
species	Count (#)	Mass (g)																		
Arrow goby		1	0.3														2	0.3		
Cheekspot goby																	2	0.1		
Total	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	2	0.3
																0	0.0	2	0.1	0
																0	0.0	0	0.0	0
																0	0.0	0	0.0	0

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Large Seine, Sta 1, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m ²)	465		791		837		767		962		2152		930	
species	Count (#)	Mass (g)												
Arrow goby			1	2	10	3.3	2	1.2			905	428.7		
Barred pipefish							1	506	4	2930			1	0.5
Bat ray					2	1.7	3	9			1	0.5		
Bay pipefish									1	715	2	668		
California butterfly ray													8	12.9
California halfbeak														
California halibut					3	36	3	40	7	643.1	3	155		
California killifish	61	10.4	4	17	11	17.2	7	18.1	3	0.6			387	167.5
Cheekspot goby							1	0.4					336	129.5
CIQ goby													141	363.2
Deepbody anchovy	82	23	29	45	909	476.4	238	80.7	878	7836	984	2130		
Diamond turbot							13	761	7	130	5	120.7		
Goby, unidentified juvenile	2	0.2							1	500				
Gray smoothhound					2	27							13	88.5
Longjaw mudsucker					3	1.7								
Pipefish, unidentified														
Queenfish							1	2	10	3523				
Round stingray									194	44.7				
Shadow goby					1	258			19	35.3				
Slough anchovy							52	13						
Staghorn sculpin							1	63	725	1296				
Topsmelt	13	27.2	38	152.2	182	361.4	110	406	1	131	142	237.4	71	40.4
Yellowfin croaker											6	86.4		
Yellowfin goby					2	72								
Total	158	61	72	216	1125	1255	432	1900	1850	17785	2048	3827	957	803

Purse Seine, Sta 1, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m ²)	1040		1040		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)												
Anchovy, unidentified juvenile											3	0.1		
Arrow goby					51	5.3	4	2.1						
Barred pipefish							1	0.8			5	1.5		
Barred sand bass							2	17						
Bat ray					9	8827	1	415			1	1350	3	3310
California butterfly ray									1	950				
California corbina					1	1257					4	1.5		
California grunion					330	284.4								
California halibut					9	124	2	103	2	60				
California killifish	2	5									5	64.2		
California needlefish					16	74.6	1	0.4	1	0.5			5	1.7
Cheekspot goby					3	0.4								
CIQ goby														
Deepbody anchovy	750	1450	241	635.8	10093	5421	31	36	1913	16316	1412	7945	614	4339
Diamond turbot					4	60	5	309	2	72	3	161	1	25
Goby, unidentified juvenile	8	0.2		4	19									
Northern anchovy					14	10.9			1	52				
Pacific sardine														
Pacific worm eel					31	32.4			51	4	1	450		
Pipefish, unidentified spp.											26	3.7		
Round stingray											2	7.3	1	10
Shadow goby														
Shiner surfperch														
Slough anchovy							225	106						
Spotfin croaker					3	282	1	98	13	5309	1	105		
Striped mullet											15	7500	2	542
Threadfin shad	4	221					1	130	132	458.1				
Topsmelt	32	88.2	1683	2971	1227	1598	62	559	1	675	13	45.2	1	2.9
White Seabass					2	70			1	41	1	15		
Yellowfin croaker					1	21					2	41		
Yellowfin goby			1	2										
Total	796	1765	1929	3628	11794	18069	336	1776	2120	23945	1493	17693	626	8221

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 1, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		138		138		138		138		138	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			1	1	1	0.4			4	0.7		
Barred pipefish					1	0.2					1	0.2
California grunion												
California halfbeak											2	0.1
California killifish	25	5.6	3	9	13	10.5	6	7.7	3	6.1	126	28.3
Cheekspot goby					1	0.3	1	0.4				
CIQ goby											108	18.1
Deepbody anchovy					308	43.4			17	36.7	2	0.2
Diamond turbot									1	31		
Longjaw mudsucker											1	1.6
Topsmelt	8	3.2	4	1.2	66	80.2	5	12	255	126.7	14	4.7
Total	33	9	8	11	390	135	12	20	280	201	254	53

Otter Trawl, Sta 1, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby	3	0.4			3	1.1			2	1.3		
Barred pipefish					11	6.3			3	2		
Barred sand bass							3	24.6				
Bay pipefish									1	1		
California butterfly ray									3	2300		
California halibut			1	1.4	35	521	37	702	6	259	1	63
Cheekspot goby					2	1						
CIQ goby											119	67.9
Deepbody anchovy			1	5	7	2.7			12	22	2	8
Diamond turbot			3	10.6	5	86	10	588	13	320	14	570
Gray smoothhound					1	175						
Opaleye									1	2		
Pipefish, unidentified spp.					6	4.2						
Round stingray					1	164			1	350	6	1970
Salema									1	0.6		
Shadow goby							37	8.4				
Slough anchovy			1	3							1	9
Staghorn sculpin	1	0.2					3	5.8				
Topsmelt			22	383								
White Seabass					1	40	1	15	1	9		
Yellowfin croaker					4	161						
Yellowfin goby							1	35	1	22		
Total	4	1	28	403	76	1162	55	1370	82	3297	144	2953

Square Encl., Sta 1, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		3		3		3		3		3	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
California killifish					1	3						
Cheekspot goby							1	0.1				
Topsmelt			2	0.1								
Total	0	0.0	2	0.1	1	3.0	1	0.1	0	0.0	0	0.0

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Large Seine, Sta 2, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006		
Area Sampled (m ²)	1349		1721		1163		1256		1050		1850		992		
species	Count (#)	Mass (g)													
Arrow goby			15	18.9	4	1.2	1	1			44	5.4			
Bat ray					1	1600					2	3110			
California butterfly ray					1	0.5									
California grunion					1	33	1	16	14	226.1	3	38.2	15	286.3	
California halibut					36	15.6	42	52.6	29	11.3	22	16.8	13	10.9	
California killifish							19	13.7					9	5.5	
Cheekspot goby							2	0.6	1	0.1			7	1.7	
ClQ goby													48	8	
Deepbody anchovy					5	15	7	19	957	320.4	26	25	10	97	
Diamond turbot							2	1			35	531.3	8	135.9	
Longjaw mudsucker								1	6.1			1	45	9	281.8
Longtail goby													3	700	
Round stingray													3	969	
Salema															
Shadow goby															
Staghorn sculpin															
Topsmelt															
Yellowfin goby															
Total	78	57	180	231	1525	2869	240	824	1292	1996	827	6148	518	2609	

Purse Seine, Sta 2, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m ²)	1040		1040		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)												
Arrow goby			4	1	69	5.8	38	6.54						
Barred pipefish					3	1.9								
Barred sand bass							1	16	2	20				
Bat ray					6	3913	1	500	1	3350			2	840
Bay pipefish	1	0.2												
California butterfly ray									1	245				
California grunion							2	4.4	94	74				
California halibut	1	0.2			4	30	4	75	9	581	4	341	1	45
California needlefish											1	39	3	459
Cheekspot goby			7	3.4	62	1.9	62	2.1					10	2.7
ClQ goby														
Deepbody anchovy	63	24.6	53	203	171	542.5	14	14	60	479.7	188	2044	38	215.4
Diamond turbot					5	270	10	718	14	427	1	29		
Giant kelpfish											1	5.2		
Goby, unidentified juvenile	5	0.2							2	6	1	2		
Northern anchovy			1	3										
Pacific herring			1	4.5										
Pacific sardine					3	8.3								
Pipefish, unidentified spp.					1	1.3								
Queenfish							1	0.7						
Round stingray									1	284			1	201
Salema											1	13		
Sargo											1	55		
Shadow goby									36	3.8				
Shovelnose guitarfish													1	7000
Slough anchovy					1	2			479	497.8			1	0.7
Spotfin croaker											1	57	2	1278
Spotted sand bass											1	152		
Striped kelpfish													2	12.7
Striped mullet									1	500				
Topsmelt	95	107.4	213	924.7	443	794.8	55	618.6	49	339.3	77	333.3	6	85.5
White seabass							2	35.7						
Yellowfin croaker									1	36	10	496		
Yellowfin goby	1	0.2					1	76	5	48.3				
Total	166	133	280	1142	769	5676	671	3065	277	6103	291	4734	64	9619

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 2, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		138		138		138		138		138	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			16	9.4			1	0.3	18	1.7		
California halibut											4	17.1
California killifish	13	7.4	2	3	38	21.3			78	27.1		
Cheekspot goby					4	0.5			1	0.2		
CIQ goby											3	1.1
Deepbody anchovy					28	5.1						
Diamond turbot									4	8.5	4	14.6
Longjaw mudsucker											3	18.8
Topsmelt	1	3	9	3.5	108	70.3	25	6.9	237	44.4	26	34
Total	14	10	27	16	178	97	26	7	338	82	40	86

Otter Trawl, Sta 2, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			3	1.1	16	2.9	3	1.4				
Barred pipefish							1	0.5				
Barred sand bass									1	53	1	40
Bat ray					1	434						
Bay pipefish	1	0.2			1	130			1	1		
California butterfly ray									1	425	1	200
California halibut	3	0.6	5	11.8	49	675.7	35	527	25	358	2	95
Cheekspot goby			4	3.3	6	1.3	10	0.7			2	1.2
CIQ goby												
Deepbody anchovy	6	8	2	11	40	2085	17	1128	1	12	2	9.6
Diamond turbot									7	212	23	975
Goby, unidentified juvenile	51	0.6			1	0.7	1	300			7	2735
Pipefish, unidentified spp.									1	55		
Round stingray									1	0.4		
Sargo									1	0.5		
Shadow goby												
Specklefin midshipman												
Spotfin croaker							1	40				
Spotted sand bass											1	135
Topsmelt	39	54.6	8	182								
White Seabass					5	271	2	225	1	15	1	12
Yellowfin croaker					1	26			40	1354	2	190
Yellowfin goby									1	10		
Total	100	64	22	209	120	3627	70	2223	81	2496	42	4393

Square Encl., Sta 2, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		3		3		3		3		3	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			1	0.4								
Atherinid, unidentified juvenile	19	0.4			3	0.1	2	0.3				
Cheekspot goby									8	1.7		
Shadow goby												
Topsmelt			1	0.2								
Total	19	0.4	2	0.6	3	0.1	2	0.3	8	1.7	0	0.0

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Large Seine, Sta 3, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m ²)	465		465		698		760		408		553		512	
species	Count (#)	Mass (g)												
Arrow goby			8	70	4	1.1					14	3.6		
Barred pipefish												1	0.1	
Barred sand bass												1	47	
Bat ray							1	196				1	322	
Bay blenny												1	31	
Bay pipefish												1	0.1	
California butterfly ray												1	117	
California grunion					6	4.15								
California halibut					3	30								
California killifish	35	10.6	9	21	1	3	17	33.6	2	5.7				
Cheekspot goby			14	1.6	1	0.2	78	4.6						
CIQ goby												37	5.7	
Deepbody anchovy			90	114	434	132.9	15	35	41	246	3	35	7	71
Diamond turbot					5	52			30	261	2	6	2	90.6
Pipefish, unidentified spp.					2	2.8								
Queenfish							1	0.5						
Sargo									1	207				
Shadow goby									5	1	1	0.7		
Spotted sand bass												4	545	
Staghorn sculpin			1	0.4										
Striped mullet							1	285						
Topsmelt	74	140.4	176	494.1	470	859.7	174	829	299	382	83	114.7	233	932
Yellowfin goby									3	46				
Total	109	151	284	700	939	1087	210	1379	488	1850	109	664	306	1753

Purse Seine, Sta 3, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m ²)	1040		1040		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)												
Arrow goby			1	0.3			4	1.6						
Barred sand bass							1	6	6	234.8	55	3590		
Bat ray					9	5981	11	7429			1	600	1	361
Bay pipefish			1	3.7							4	5		
California butterfly ray					1	1190								
California grunion					887	1219			71	50.5				
California halibut	1	0.2	2	3	38	341.4	10	177	1	8			3	346
California needlefish														
Cheekspot goby			3	2	1	0.2	13	0.6						
Deepbody anchovy	30	62.4	65	398	253	1231	11	19.5	35	306	45	497.9	608	4672
Diamond turbot					67	3063	17	1585	11	496				
Goby, unidentified juvenile	1	0.2												
Kelp bass									1	132	3	145	1	39
Northern anchovy									2	1.9	1	3.3		
Pacific sardine												2	3.5	
Queenfish													1	408
Round stingray							2	313						
Sargo									1	123	23	2320		
Shadow goby									8	1				
Slough anchovy							117	103.8						
Spotfin croaker							1	1000	1	56				
Spotted sand bass									1	129			4	513
Striped mullet									1	626				
Topsmelt	44	207.6	347	2022	102	977.1	204	1843	59	297.4	16	351.1	361	4945
Walleye surferch											1	133		
White seabass											1	250		
Yellowfin croaker					5	281	3	355	2	284	3	140		
Yellowfin goby									2	37				
Total	76	270	419	2429	1366	14291	394	12834	202	2783	155	8039	979	11284

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 3, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		138		138		138		138		138	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			1	0.4	5	0.9			6	0.9		
Bay blenny											1	0.7
California halibut			1	0.7					1	20.8		
California killifish			9	12.2	8	16	1	0.2	12	34	1	2.1
Cheekspot goby							27	0.6				
CIQ goby											20	3.4
Deepbody anchovy							61	26.7	1	1		
Diamond turbot											1	9
Shadow goby									1	0.5		
Slough anchovy									9	21		
Staghorn sculpin	1	0.2										
Topsmelt	9	16.4	41	9.1	99	82.3	91	25	124	63.8	354	657.7
Grand Total	19	29	51	26	166	110	140	82	133	88	383	684

Otter Trawl, Sta 3, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			11	3.6	24	5.1						
Barred pipefish					5	4.4						
Barred sand bass							2	3.2	7	325		
Bay blenny											1	35
Bay pipefish			2	2.2					1	1		
California butterfly ray					2	1598	1	180				
California halibut	1	33	8	116.8	39	393.9	33	494	3	28		
Cheekspot goby	3	0.2	47	30.1	37	3	14	0.3				
Deepbody anchovy	2	6	8	54			116	5409	33	2244	1	51
Diamond turbot									6	203	11	345
Kelp bass											1	500
Round stingray									3	175	3	635
Sargo										1	9	
Shiner surfperch									1	0.4		
Specklefin midshipman									5	84	1	43
Spotted sand bass											5	850
Staghorn sculpin			2	33								
Topsmelt	1	25	5	105.1			1	42	1	100	2	93
White Seabass							5	312				
Yellowfin croaker												
Total	7	64	83	345	229	7768	89	3106	26	928	21	2365

Square Encl., Sta 3, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		3		3		3		3		3	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby					4	0.1						
Atherinid, unidentified juvenile	3	0.1			5	0.6						
Cheekspot goby											4	0.3
CIQ goby												
Diamond turbot	2	0.06			1	6						
Goby, unidentified juvenile							2	0.2				
Shadow goby									1	0.1		
Topsmelt			2	0.8								
Total	5	0.2	2	0.8	10	6.7	2	0.2	1	0.1	4	0.3

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Large Seine, Sta 4, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m³)	620		496		496		527		560		505		791	
species	Count (#)	Mass (g)												
Arrow goby			1	0.4	4	1					13	1.4		
Barred pipefish					2	1.1								
Barred sand bass							2	30	1	246	14	317.6		
Bat ray							5	2012						
Bay blenny											2	1.7		
Bay pipefish											7	8.5	2	1
California grunion					21	20.4								
California halibut			1	3	16	62.5	25	197	12	84.5	3	24.4		
California killifish					1	3	3	10	26	10.9			2	3.6
Cheekspot goby					1	0.3	11	0.6						
CIQ goby			5	2									38	1.7
Deepbody anchovy	1	0.2	1207	4059	69	94.3	1	4	1	113				
Diamond turbot			2	2.5	2	50	3	206	8	75			2	7.8
Dwarf surfperch											19	104	1	2.7
Giant kelpfish													9	298.6
Kelp bass							1	7						
Kelp rockfish											1	16.2		
Mussel blenny	2	0.2												
Pacific worm eel									1	20				
Pipefish, unidentified spp.					3	2.5								
Shadow goby									71	16				
Shiner surfperch											52	321.7	2	11.2
Slough anchovy							24	64						
Spotfin croaker					1	61								
Spotted sand bass													1	627
Staghorn sculpin					2	25			2	16.1	2	32		
Topsmelt	10	111			322	386.1	257	199.7	731	895.8	1001	1865	285	1821
Walleye surfperch							1	82						
White Seabass					2	30								
Yellowfin goby	1	58			3	47	1	53	4	69.9				
Total	14	169	1216	4067	449	784	334	2865	857	1547	1116	2701	340	2767

Purse Seine, Sta 4, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-1999		July-2001		July-2006	
Area Sampled (m³)	1040		1040		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)												
Arrow goby					29	14.2	13	3.4						
Barred pipefish					4	1.8	2	0.1	1	0.1				
Barred sand bass					7	1.5	40	129.7	8	717	53	3185	3	374
Bat ray					2	768	2	1050	5	4008			1	3500
Bay blenny			1	0.7										
Bay goby			5	8.7			1	0.8	1	3				
Bay pipefish													2	18
California barracuda											1	450	1	4000
California butterfly ray					77	83.1			55	46.3				
California grunion			1	0.2	3	4.2	17	112.6	6	72				
California halibut			2	128			1	33			1	17	6	1264
California needlefish							52	6.5	5	0.5				
Cheekspot goby			2	0.5										
CIQ goby			1	3	64	161	202	489	433	869.4	276	2520	55	532.5
Deepbody anchovy	1	3											81	622.1
Diamond turbot					5	510	3	194	2	322			2	392
Giant kelpfish									2	3.1				
Gray smoothhound					1	579								
Kelp bass					5	1.8	2	1.4						
Northern anchovy			13	169					18	28.2	5	7		
Pacific sardine					8	30					7	28.5		
Pipefish, unidentified spp.					2	1.1					1	1.9		
Queenfish					4	75.5					4	69		
Salema					1	0.3								
Shiner surfperch									30	194.8	6	33.8	1	4.6
Slough anchovy			2	2			125	137.6						
Spotfin croaker					2	1486	1	14						
Spotted sand bass					3	3.1	3	455.2	8	1856	1	150	11	4540
Spotted turbot					1	28								
Topsmelt	56	240.4	242	1139	1565	4903	1403	19008	169	1571	972	2943	164	1723
White Seabass					5	176	1	200						
Yellowfin croaker					2	268			1	128	10	626.5	1	163
Yellowfin goby					1	0.7								
Total	58	244	334	1613	1999	9543	2041	22169	576	11397	1116	8044	274	17144

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 4, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
Area Sampled (m ²)	138	138	138	138	138	138	138	138	138	138	138	138
species	Count (#)	Mass (g)										
Arrow goby			1	0.6	4	0.9			9	1.4		
Barred pipefish									1	19		
Barred sand bass									7	5.4		
Bay pipefish					6	8.1						
California grunion					9	31.4			1	11.5		
California halibut							2	7				
California killifish					4	1.1	1	0.1				
Cheekspot goby											4	5.4
CIQ goby											5	1.4
Deepbody anchovy					39	21.3	1	6				
Diamond turbot			1	0.7	2	43						
Dwarf surfperch									2	7.3		
Giant kelpfish									7	34.8		
Longjaw mudsucker			1	13								
Pipefish, unidentified spp.					2	0.8						
Salema					1	0.7						
Shiner surfperch									3	20.5		
Staghorn sculpin			1	0.1								
Topsmelt			5	1	74	55.4	13	53	738	1185	284	363.3
Yellowfin goby							1	37				
Total	0	0	9	15	141	163	18	103	768	1285	294	370

Otter Trawl, Sta 4, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
Area Sampled (m ²)	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040
species	Count (#)	Mass (g)										
Arrow goby			2	0.8	4	1.7	6	2.3				
Barred pipefish							3	0.2				
Barred sand bass					4	2.3	8	29	6	639		
Bat ray									1	800		
Bay blenny					2	4.8			2	27		
Bay pipefish	1	0.2										
Black surfperch									2	82		
Brown smoothhound					1	1191						
California butterfly ray					1	1092						
California halibut	1	1	8	9.7	33	439.8	41	574			10	32
California tonguefish			2	2.1								
Cheekspot goby			11	7.6	2	0.3	5	0.3			16	1.5
CIQ goby												
Deepbody anchovy	2	13	15	90	1	0.5						
Diamond turbot	1	145	3	16.2	8	647	3	365	1	160	9	1234
Gray smoothhound			1	260								
Hornyhead turbot											1	5
Kelp bass									4	60		
Round stingray	1	550							1	150	2	580
Shiner surfperch									3	27	2	10
Shovelnose guitarfish							1	115			3	0.8
Specklefin midshipman												
Spotfin croaker					1	192						
Spotted sand bass					2	323.2	1	17	2	500	5	890
Spotted turbot	4	20.3	1	93	4	198						
Staghorn sculpin					1	26						
White Seabass					1	65	4	321	1	115	1	240
Yellowfin croaker									1	240	5	655
Yellowfin goby	1	45										
Total	7	754	48	565	70	4442	69	1218	23	2685	53	3408

Square Encl., Sta 4, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
Area Sampled (m ²)	3	3	3	3	3	3	3	3	3	3	3	3
species	Count (#)	Mass (g)										
Arrow goby					1	0.1			4	0.1		
Atherinid, unidentified juvenile	1	0.1			1	10						
California halibut					1	0.3	6	0.3				
Cheekspot goby												
Total	1	0.1	0	0.0	3	10.4	6	0.3	4	0.1	0	0.0

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Large Seine, Sta 5, Nighttime	Jan-1997	Apr-1997	July-1997	Oct-1997	July-1999	July-2001	July-2006			
Area Sampled (m²)	1798	1876	2201	1256	1876	1110	2821			
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			10	2.1			3	0.8		
Barred sand bass			1	0.3					1	1775
Bat ray			2	5						
Bay blenny										
California butterfly ray			205	92.1	4	39.1	3	6.2		
California grunion			2	5.5			11	65.4	4	30.3
California halibut			23	82.1			4	10.8	1	1.6
California killifish									4	13.7
California needlefish									3	384
Cheekspot goby			8	1.6			12	1.9		
CIQ goby									83	15.9
Deepbody anchovy			4	12	53	21	6	25.4		
Diamond turbot					4	157				
Goby, unidentified juvenile					1	0.4				
Kelp bass					9	31.2				
Opaleye										
Pipefish, unidentified spp.										
Round stingray					1	2				
Sargo									5	1241
Shadow goby									2	1045
Shiner surfperch					5	7	1	2		
Slough anchovy							25	2.9	1	0.7
Spotfin croaker										
Spotted sand bass									1	2.3
Staghorn sculpin									7	1608
Topsmelt	130	221.6	264	296.1	567	669.4	162	642	1733	2694
Walleye surfperch	4	245	1	58					513	960.3
Yellowfin croaker								1	23.8	
Yellowfin goby	1	21			1	11			1	5.3
Total	136	492	274	373	890	1165	172	707	1825	3197
									526	1046
									500	10438

Purse Seine, Sta 5, Nighttime	Jan-1997	Apr-1997	July-1997	Oct-1997	July-1999	July-2001	July-2006	
Area Sampled (m²)	1040	1040	1040	1040	1040	1040	1040	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			4	2.5	5	0.6	5	0.5
Barred sand bass					13	3.7	16	358.2
Bat ray					22	16250	5	2350
Bay goby					1	0.2		
Bay pipefish								
Black surfperch								
Bonefish							6	481
California barracuda					1	8		
California flyingfish					2	75		
California grunion							2	3.5
California halibut					3	17		
California needlefish								
California tonguefish								
Cheekspot goby								
Deepbody anchovy	4	18	129	294	32	5.7	1	0.1
Diamond turbot					584	787.1	45	37
Dwarf surfperch					6	613	2	205
Giant kelpfish								
Goby, unidentified juvenile								
Gray smoothhound								
Jacks melt								
Kelp bass								
Northern anchovy								
Opaleye								
Pacific herring								
Pacific sardine								
Pacific worm eel								
Pipefish, unidentified spp.								
Queenfish								
Round stingray								
Salema								
Sand bass, unidentified								
Sargo								
Shadow goby								
Shiner surfperch								
Slough anchovy								
Spotfin croaker								
Spotted sand bass					33	18617	46	58.8
Spotted turbot					18	777.6		
Staghorn sculpin								
Striped kelpfish								
Striped mullet								
Topsmelt	34	555	446	970.7	459	1019	214	1442
Walleye surfperch							311	1756
White seabass							640	2321
White Surfperch							3	321
Yellowfin croaker								
Total	38	573	587	1614	1261	41159	373	5709
							834	21425
							874	7130
							985	28157

Number of individuals and mass, with area sampled, by gear type, station, and sampling period.

Small Seine, Sta 5, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		138		138		138		138		138	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
California halibut											1	3.3
California killifish	5	0.2			14	18.5	3	16	5	16.4	4	7.6
CIQ goby											3	0.9
Topsmelt	3	5.2	10	0.4	11	2.4			9	1.5	13	19
Total	8	5	10	0	25	21	3	16	14	18	21	31

Otter Trawl, Sta 5, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		1040		1040		1040		1040		1040	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby			3	0.7			7	4.7				
Barred pipefish							1	0.2				
Barred sand bass					1	1.1	4	27.5	8	250	1	101
Bay blenny									1	25		
Bay pipefish											2	1.5
Black surfperch											19	717
California butterfly ray					2	286					4	787
California halibut			4	1	65	445.5	45	517	1	33	4	109
California tonguefish					1	2						
Cheekspot goby			15	9.6			20	1				
CIQ goby			6	1.7								
Deepbody anchovy	4	12	30	107	5	4.3						
Diamond turbot					15	662	10	673			5	982
Dwarf surfperch									1	2		
Giant kelpfish			1	0.4					1	4		
Kelp bass											1	103
Opaleye									1	80		
Pipefish, unidentified spp.					1	0.3						
Queenfish					11	18.4	2	2.4				
Round stingray					1	246					47	11082
Sargo									2	107	1	44
Shadow goby									1	0.3		
Shiner surfperch									2	15		
Spotfin croaker					1	9						
Spotted sand bass							6	67			7	2592
Staghorn sculpin			2	16								
Topsmelt	32	515	2	0.5								
Walleye surfperch			1	0.7					1	82		
White seabass					1	27						
Yellowfin croaker			3	435	1	45	1	6	1	190	4	515
Total	36	527	67	573	105	1747	96	1299	20	788	95	17034

Square Encl., Sta 5, Nighttime	Jan-1997		Apr-1997		July-1997		Oct-1997		July-2001		July-2006	
	Area Sampled (m ²)		3		3		3		3		3	
species	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)	Count (#)	Mass (g)
Arrow goby									3	0.3		
Goby, unidentified juvenile					4	0.1						
Total	0	0.0	0	0.0	4	0.1	0	0.0	3	0.3	0	0.0

Appendix A5-4. Range of standard lengths by fish species

Appendix A5-4. Maximum and minimum standard length (mm) of all fish species captured during all surveys (1997-2006).

Species	Minimum SL (mm)	Maximum SL (mm)	Species	Minimum SL (mm)	Maximum SL (mm)
Arrow goby	10	53	Longtail goby	105	192
Barred pipefish	35	213	Mussel blenny	20	20
Barred sand bass	18	320	Northern anchovy	20	150
Barred surfperch	135	210	Opaleye	21	350
Bat ray (disc length)	130	675	Pacific cutlassfish	595	595
Bay blenny	11	128	Pacific herring	34	70
Bay goby	26	129	Pacific Sanddab	82	85
Bay pipefish	21	291	Pacific sardine	33	180
Black croaker	17	96	Pacific worm eel	260	380
Black surfperch	38	230	Pile surfperch	64	648
Bonefish	22	305	Pipefish	33	173
Brown smoothhound	610	750	Pipefish, unidentified juvenile	21	21
California barracuda	111	145	Queenfish	21	195
California butterfly ray (disc length)	135	535	Redtail surfperch	50	58
California corbina	195	500	Round herring	22	68
California flyingfish	144	152	Round stingray (disc length)	74	452
California grunion	11	133	Salema	15	108
California halfbeak	26	153	Sargo	39	325
California halibut	10	525	Sculpin, unidentified species	25	25
California killifish	11	90	Sebastes, unidentified juvenile	17	17
California lizardfish	55	55	Shadow goby	12	69
California needlefish	65	786	Shiner surfperch	10	165
California scorpionfish	39	88	Shovelnose guitarfish	310	1130
California tonguefish	46	150	Slough anchovy	24	122
Cheekspot goby	10	54	Specklefin midshipman	18	30
CIQ goby	10	63	Spotfin croaker	34	510
Deepbody anchovy	10	149	Spotted kelpfish	26	47
Diamond turbot	9	255	Spotted sand bass	18	691
Dwarf surfperch	34	130	Spotted turbot	48	168
Giant kelpfish	22	210	Staghorn sculpin	13	162
Gray smoothhound	240	1110	Striped kelpfish	27	155
Halfmoon	15	15	Striped mullet	13	480
Herring, unidentified juvenile	15	15	Striped perch	79	79
Hornyhead turbot	85	97	Threadfin shad	55	167
Jacksmelt	42	291	Topsmelt	8	278
Kelp bass	15	260	Walleye surfperch	31	180
Kelp rockfish	80	80	White seabass	61	460
Kelpfish, unidentified juvenile	26	26	White surfperch	45	182
Leopard shark	510	1140	Yellowfin croaker	34	420
Longjaw mudsucker	33	110	Yellowfin goby	14	235
Longnose puffer	53	53	Zebraperch	283	320

Appendix A5-5. Fish species observed within coastal wetlands of southern California

Appendix A5-5. Fish species captured with coastal wetlands of southern California.

Common Name	Scientific Name	Agua Hedionda Lagoon ^{1,2}	San Elijo Lagoon ³	San Dieguito Lagoon ^{3,4}	Los Peñasquitos Lagoon ^{3,5,6}	Anaheim Bay ²⁰	San Diego Bay ^{7,8,9}	Upper Newport Bay ^{10,11,12}	Mission Bay ^{8,6}	Los Angeles Harbor ^{13, 14, 15, 16,}	Bolsa Chica ¹⁷	Ballona Wetlands ^{18, 19}	Batiquitos Lagoon pre- and post-restoration	
Spiny dogfish	<i>Squalus acanthias</i>					+	+		+	+				
Horn shark	<i>Heterodontus francisci</i>					+	+	+	+	+	+			
Gray smoothhound	<i>Mustelus californicus</i>	+				+	+	+	+	+	+			+
Leopard shark	<i>Triakis semifasciata</i>	+				+					+			+
Brown smoothhound	<i>Mustelus henlei</i>	+		+		+	+		+	+	+			+
Banded guitarfish	<i>Zapteryx exasperata</i>						+							
Shovelnose guitarfish	<i>Rhinobatos productus</i>	+					+			+			+	+
Pacific electric ray	<i>Torpedo californica</i>									+				
Thornback ray	<i>Platyrhinoidis triseriata</i>	+						+		+	+			
California skate	<i>Raja inornata</i>									+				
Round stingray	<i>Urotrygon halleri</i>	+				+	+	+	+	+	+		+	+
Bat ray	<i>Myliobatis californica</i>	+		+			+		+	+	+			+
California butterfly ray	<i>Gymnura marmorata</i>	+							+	+	+			+
Diamond stingray	<i>Dasyatis dipterura</i>	+												
Machete	<i>Elops affinis</i>					+								
Bonefish	<i>Albula vulpes</i>						+		+		+			+
Pacific worm eel	<i>Myrophis wafer</i>													+
Pacific herring	<i>Clupea pallasi</i>													+
Round herring	<i>Etrumeus teres</i>					+								+
Pacific sardine	<i>Sardinops sagax</i>	+				+	+				+	+		+
Threadfin shad	<i>Dorosoma petenense</i>			+			+							+
Deepbody anchovy	<i>Anchoa compressa</i>	+	+	+		+	+	+	+	+	+	+		+
Slough anchovy	<i>Anchoa delicatissima</i>	+				+	+	+	+	+	+	+		+
Northern anchovy	<i>Engraulis mordax</i>	+		+			+	+	+	+	+	+		+
California lizardfish	<i>Synodus lucioceps</i>						+							+
Specklefin midshipman	<i>Porichthys myriaster</i>	+				+	+	+	+	+	+			+
Plainfin midshipman	<i>Porichthys notatus</i>	+			+		+							+
Kelp clingfish	<i>Rimicola muscarum</i>						+							
Basketweave cusk-eel	<i>Ophidion scrippae</i>										+			
Spotted cusk-eel	<i>Chilara taylori</i>										+			
California flyingfish	<i>Cheilopogon pinnatibarbatus californicus</i>													+
Sharpchin flyingfish	<i>Fodiator acutus</i>					+								
California halfbeak	<i>Hyporhamphus rosae</i>						+			+				+
California needlefish	<i>Strongylura exilis</i>	+	+	+			+		+	+	+			+
California killifish	<i>Fundulus parvipinnis</i>	+	+	+	+	+	+	+	+	+	+		+	+
California grunion	<i>Leuresthes tenuis</i>	+		+			+	+			+	+		+
Jacksmelt	<i>Atherinopsis californiensis</i>	+		+		+	+			+	+			+
Topsmelt	<i>Atherinops affinis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+

Appendix A5-5. Fish species captured with coastal wetlands of southern California.

Common Name	Scientific Name	Agua Hedionda Lagoon ^{1,2}	San Elijo Lagoon ³	San Dieguito Lagoon ^{3,4}	Los Peñasquitos Lagoon ^{3,5,6}	Anaheim Bay ²⁰	San Diego Bay ^{7,8,9}	Upper Newport Bay ^{10, 11, 12}	Mission Bay ^{8,6}	Los Angeles Harbor ^{13, 14, 15, 16,}	Bolsa Chica ¹⁷	Ballona Wetlands ^{18, 19}	Batiquitos Lagoon pre- and post-restoration
Sailfin molly	<i>Poecili latipinna</i>						+					+	
Pacific seahorse	<i>Hippocampus ingens</i>						+						
Kelp pipefish	<i>Syngnathus californiensis</i>						+				+		
Bay pipefish	<i>Syngnathus leptorhynchus</i>	+		+		+	+	+	+	+		+	+
Snubnose pipefish	<i>Cosmocampus arctus</i>				+		+				+		
Barcheek pipefish	<i>Syngnathus exilis</i>						+			+			
Barred pipefish	<i>Syngnathus aulicus</i>	+		+		+	+		+	+	+		+
Sculpin (Ca. scorpionfish)	<i>Scorpaena guttata</i>	+					+		+	+			+
Grass rockfish	<i>Sebastodes rastrelliger</i>				+					+			
Rockfish, unidentified juvenile	<i>Sebastes sp.</i>												+
Kelp rockfish	<i>Sebastes atrovirens</i>	+											+
Black rockfish	<i>Sebastes melanops</i>									+			+
Staghorn sculpin	<i>Leptocottus armatus</i>	+		+	+	+	+	+	+	+	+	+	+
Striped bass	<i>Morone saxatilis</i>							+					
Kelp bass	<i>Paralabrax clathratus</i>	+					+			+	+		+
Spotted sand bass	<i>Paralabrax maculatofasciatus</i>	+		+			+			+	+		+
Barred sand bass	<i>Paralabrax nebulifer</i>	+		+			+			+	+		+
Jack mackerel	<i>Trachurus symmetricus</i>	+					+			+			
Lookdown	<i>Selene vomer</i>						+						
Pompano	<i>Trachinotus sp.</i>	+											
Salema	<i>Xenistius californiensis</i>						+			+	+	+	+
Sargo	<i>Anisotremus davidsonii</i>	+					+			+	+		+
Queenfish	<i>Seriphis politus</i>	+		+	+	+	+	+	+	+	+	+	+
White seabass	<i>Atractoscion nobilis</i>					+	+	+		+			
Shortfin corvina	<i>Cynoscion parvipinnis</i>						+						
Orangemouth corvina	<i>Cynoscion xanthulus</i>						+						
Yellowfin croaker	<i>Umbrina roncador</i>	+				+	+	+	+	+	+	+	+
California corbina	<i>Menticirrhus undulatus</i>	+		+	+	+				+	+		+
Spotfin croaker	<i>Roncador stearnsii</i>	+			+		+			+			+
White croaker	<i>Genyonemus lineatus</i>			+		+	+			+			
Black croaker	<i>Cheilotrema saturnum</i>					+	+		+	+	+	+	+
Opaleye	<i>Girella nigricans</i>	+		+			+						
Zebraperch	<i>Hermosilla azurea</i>	+				+							
Halfmoon	<i>Medialuna californiensis</i>			+			+						
Black surfperch	<i>Embiotoca jacksoni</i>	+					+		+	+			
Barred surfperch	<i>Amphistichus argenteus</i>			+						+			
Walleye surfperch	<i>Hyperprosopon argenteum</i>	+		+		+	+			+	+		
Shiner surfperch	<i>Cymatogaster aggregata</i>	+		+		+	+	+	+	+	+		
Dwarf surfperch	<i>Micrometrus minimus</i>	+					+		+	+			

Appendix A5-5. Fish species captured with coastal wetlands of southern California.

Common Name	Scientific Name	Agua Hedionda Lagoon ^{1,2}	San Elijo Lagoon ³	San Dieguito Lagoon ^{3,4}	Los Peñasquitos Lagoon ^{3,5,6}	Anaheim Bay ²⁰	San Diego Bay ^{7,8,9}	Upper Newport Bay ^{10, 11, 12}	Mission Bay ^{8,6}	Los Angeles Harbor ^{13, 14, 15, 16}	Bolsa Chica ¹⁷	Ballona Wetlands ^{18, 19}	Batiquitos Lagoon pre- and post-restoration
Pile surfperch	<i>Rhacochilus vacca</i>									+			+
Calico surfperch	<i>Amphistichus koelzi</i>									+			
Redtail surfperch	<i>Amphistichus rhodoterus</i>												+
Striped surfperch	<i>Embiotoca lateralis</i>												+
Pink surfperch	<i>Zalembius rosaceus</i>									+			
Rainbow surfperch	<i>Hypsurus caryi</i>									+			
White surfperch	<i>Phanerodon furcatus</i>						+		+	+			+
Blacksmith	<i>Chromis punctipinnis</i>	+		+	+		+		+	+			
Striped mullet	<i>Mugil cephalus</i>	+	+	+	+	+	+	+	+		+	+	+
California barracuda	<i>Sphyraena argentea</i>	+				+	+	+	+	+			+
Blue bobo	<i>Polydactylus approximans</i>						+						
Senorita	<i>Oxyjulis californica</i>						+						
Rock wrasse	<i>Halichoeres semicinctus</i>						+			+			
Bay blenny	<i>Hypsoblennius gentilis</i>	+				+	+		+		+		+
Rockpool blenny	<i>Hypsoblennius gilberti</i>		+							+			
Mussel blenny	<i>Hypsoblennius jenkinsi</i>			+									+
Reef finspot	<i>Paraclinus integripinnis</i>						+		+				
Giant kelpfish	<i>Heterostichus rostratus</i>	+				+	+		+	+	+		+
Striped kelpfish	<i>Gibbonsia metzi</i>						+		+				+
Spotted kelpfish	<i>Gibbonsia elegans</i>						+		+	+			+
Crevice kelpfish	<i>Gibbonsia montereyensis</i>						+						
Tidewater goby	<i>Eucycloplus newberryi</i>				+								
Longjaw mudsucker	<i>Gillichthys mirabilis</i>	+	+	+	+	+	+	+			+	+	+
Longjaw goby	<i>Gobiopsis macrostoma</i>										+		
Longtail goby	<i>Ctenogobius sagittula</i>					+			+				+
Yellowfin goby	<i>Acanthogobius flavimanus</i>	+	+	+	+	+	+	+	+	+	+		+
Bay goby	<i>Lepidogobius lepidus</i>				+	+				+			+
Chameleon goby	<i>Tridentiger trigonocephalus</i>						+						
Cheekspot goby	<i>Ilypnus gilberti</i>	+			+	+	+	+		+	+	+	+
Arrow goby	<i>Clevelandia ios</i>	+			+	+	+	+				+	+
Shadow goby	<i>Quietula y-cauda</i>	+	+	+	+	+	+	+					+
Pacific cutlassfish	<i>Trichiurus nitens</i>									+			+
Pacific mackerel	<i>Scomber japonicus</i>							+					
Pacific bonito	<i>Sarda chilensis</i>									+			
Pacific butterfish	<i>Peprilus simillimus</i>									+			
California tonguefish	<i>Syphurus atricauda</i>	+					+	+		+	+		+
California halibut	<i>Paralichthys californicus</i>	+	+	+	+	+	+	+	+	+	+	+	+
English sole	<i>Parophrys vetulus</i>									+			
Fantail sole	<i>Xystreurus liolepis</i>							+					+

Appendix A5-5. Fish species captured with coastal wetlands of southern California.

Sources (see full citations in list of literature cited in Chapter 5):

- 1 MEC 1995
- 2 Merkel & Associates 2006
- 3 MEC 1993a
- 4 USFWS 1999
- 5 West and Cordrey 2002.
- 6 Williams et al. 1998
- 7 Allen 1999
- 8 Hoffman 2006
- 9 Merkel & Associates 1997
- 10 Allen 1982
- 11 Horn and Allen 1981a
- 12 Cross & Allen (1993) report 46 species of fish in Upper Newport Bay
- 13 MEC 2002
- 14 MEC 1988
- 15 Horn and Allen 1981b
- 16 Allen et al. 1983
- 17 Merkel & Associates 2008, in prep.
- 18 City of LA, 2005
- 19 Merkel & Associates 2009, in prep.
- 20 MEC 1993b

Appendix A5-6. Water quality data collected coincident with fisheries monitoring

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (surface waters 1997).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)	Secchi Depth (m)	Nitrate (mg/L)	Ortho-phosphate (mg/L)	Chlorophyll a (mg/m³)
1	Jan-97	15.4	5.85	30.2	7.8	22.2	0.2	0.70	0.10	2.90
1	Apr-97	23.4	5.78	31.4	8.3	NM	0.8	0.05	0.07	7.39
1	Jul-97	24.7	5.48	33.3	8.8	6.9	NM	0.08	0.03	3.66
1	Oct-97	19.8	6.51	33.7	7.7	0.8	0.8	0.09	0.07	2.61
2	Jan-97	13.5	5.95	28.1	7.9	11.6	0.2	0.25	0.04	7.16
2	Apr-97	21.9	6.17	32.1	8.2	NM	1.2	0.06	0.05	4.82
2	Jul-97	21.9	6.06	33.0	7.6	6.1	NM	0.07	ND	ND
2	Oct-97	19.7	7.16	34.5	7.8	0.0	0.8	0.07	0.04	1.08
3	Jan-97	13.9	6.18	29.8	7.9	19.4	0.6	0.15	ND	2.92
3	Apr-97	21.7	6.70	32.2	8.2	NM	1.2	0.07	0.04	4.40
3	Jul-97	21.6	6.45	33.0	8.3	0.0	NM	0.08	ND	1.00
3	Oct-97	19.8	7.11	34.7	7.8	0.0	1.1	0.07	0.02	1.40
4	Jan-97	14.0	6.49	31.2	8.0	4.2	0.9	0.18	ND	3.09
4	Apr-97	20.1	6.33	31.2	8.1	NM	1.5	0.05	0.03	1.63
4	Jul-97	21.4	6.58	33.1	8.6	10.6	NM	0.06	ND	1.00
4	Oct-97	19.8	7.64	34.7	7.8	0.0	1.0	0.06	0.02	1.20
5	Jan-97	13.7	6.27	30.5	8.0	22.6	1.3	0.18	ND	3.09
5	Apr-97	18.9	6.42	32.9	8.1	NM	2.4	0.05	0.03	1.00
5	Jul-97	21.2	6.87	33.1	7.4	0.0	NM	0.14	ND	1.67
5	Oct-97	20.5	6.61	34.7	7.9	0.0	1.5	0.06	0.03	ND

NM = not measured due to equipment failure or loss of data.

ND = not detected (below detection limits).

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (bottom waters 1997).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-97	14.5	6.41	31.7	7.1	27.7
	Apr-97	23.2	5.75	31.9	8.2	NM
	Jul-97	24.6	4.91	33.4	8.0	17.5
	Oct-97	19.3	5.97	33.4	7.7	5.6
2	Jan-97	14.5	6.52	32.0	7.9	10.4
	Apr-97	21.2	6.59	32.3	8.0	NM
	Jul-97	21.8	6.04	33.1	8.0	2.6
	Oct-97	19.2	7.17	34.1	7.8	3.8
3	Jan-97	13.9	6.36	30.1	8.0	22.6
	Apr-97	20.5	6.98	32.6	7.9	NM
	Jul-97	21.4	6.55	33.1	8.1	2.6
	Oct-97	19.3	7.16	34.5	7.8	0.0
4	Jan-97	14.1	6.78	31.0	8.0	7.9
	Apr-97	20.0	6.22	31.0	8.0	NM
	Jul-97	21.3	6.56	33.1	7.7	0.0
	Oct-97	19.9	7.47	34.8	7.8	0.0
5	Jan-97	13.7	6.51	30.7	8.0	12.1
	Apr-97	18.9	6.49	32.9	8.3	NM
	Jul-97	21.3	6.67	33.1	7.3	0.0
	Oct-97	19.6	6.93	34.2	7.9	0.0

NM = not measured due to equipment failure.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (surface waters 1998).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)	Secchi Depth (m)	Nitrate (mg/L)	Ortho-phosphate (mg/L)	Chlorophyll a (mg/m³)
1	Jan-98	16.9	7.81	33.4	8.1	0.0	0.8	0.10	0.05	1.15
1	Apr-98	17.2	8.74	17.7	8.1	29.6	0.7	0.11	0.07	0.87
1	Jul-98	24.4	4.32	33.8	7.9	0.2	0.7	0.06	ND	1.09
1	Oct-98	19.7	6.43	34.3	8.0	0.0	0.6	0.07	ND	0.89
2	Jan-98	17.5	7.66	34.0	8.3	0.0	0.9	0.12	ND	1.15
2	Apr-98	16.5	8.27	23.1	8.1	4.1	0.7	0.10	0.04	1.00
2	Jul-98	23.5	5.25	34.0	8.0	3.2	0.7	0.04	0.02	1.08
2	Oct-98	19.5	6.88	34.5	8.1	0.0	0.9	0.08	ND	0.74
3	Jan-98	17.2	7.63	34.6	8.3	4.0	0.9	0.10	0.02	ND
3	Apr-98	16.4	7.42	31.0	8.0	0.0	0.9	0.12	0.03	0.70
3	Jul-98	23.4	5.20	34.5	8.0	0.0	0.7	0.05	0.06	1.08
3	Oct-98	19.6	6.87	34.5	8.1	0.0	1.2	0.07	ND	1.04
4	Jan-98	17.5	7.98	34.7	8.3	0.0	1.3	0.10	0.03	1.24
4	Apr-98	16.4	7.86	30.9	8.0	21.9	1.2	0.11	ND	ND
4	Jul-98	21.1	5.94	34.6	8.0	6.5	1.3	0.07	0.03	1.06
4	Oct-98	19.7	7.15	34.3	8.1	0.0	1.8	0.08	ND	1.04
5	Jan-98	18.0	8.34	35.1	8.3	0.0	1.3	0.07	ND	ND
5	Apr-98	15.7	7.86	33.7	8.0	9.0	1.5	0.12	0.03	1.44
5	Jul-98	20.7	6.48	34.5	8.0	0.0	1.2	0.05	0.03	1.07
5	Oct-98	21.6	7.35	34.3	8.1	0.0	1.5	0.08	ND	0.59

ND = not detected (below detection limits).

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (bottom waters 1998).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-98	17.1	7.06	35.4	8.1	3.9
	Apr-98	17.7	6.10	28.7	7.9	4.8
	Jul-98	24.0	5.59	34.5	8.0	8.6
	Oct-98	19.1	6.34	34.3	8.0	8.5
2	Jan-98	17.1	7.60	35.0	8.3	3.1
	Apr-98	16.9	6.83	31.5	7.9	5.7
	Jul-98	22.9	4.92	34.5	8.0	39.2
	Oct-98	19.4	6.96	34.4	8.1	1.0
3	Jan-98	17.1	7.67	34.9	8.3	4.4
	Apr-98	16.4	7.49	31.1	8.0	9.3
	Jul-98	22.5	5.41	34.5	8.0	1.4
	Oct-98	19.4	7.09	34.3	8.1	0.7
4	Jan-98	17.6	8.12	35.2	8.3	0.0
	Apr-98	15.8	7.80	33.5	8.0	6.1
	Jul-98	19.7	6.80	34.6	8.0	11.8
	Oct-98	19.4	7.14	34.1	8.1	0.0
5	Jan-98	17.1	7.75	35.3	8.3	0.3
	Apr-98	15.9	6.87	33.7	7.9	9.2
	Jul-98	19.4	6.55	34.6	8.0	5.1
	Oct-98	19.8	7.94	34.3	8.1	0.0

NM = not measured due to equipment failure.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (surface waters 1999).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)	Secchi Depth (m)	Nitrate (mg/L)	Ortho-phosphate (mg/L)	Chlorophyll a (mg/m³)
1	Jan-99	11.5	7.71	32.2	8.2	0.0	1.04*	0.11	0.06	1.36
1	Apr-99	16.6	7.80	29.9	8.1	0.0	0.6	0.10	0.05	4.12
1	Jul-99	24.9	5.44	34.8	7.9	7.2	0.6	ND	0.03	0.70
1	Oct-99	20.1	6.58	32.8	8.0	0.0	0.6	0.09	0.03	ND
2	Jan-99	13.7	7.83	33.7	8.3	0.0	1.8	0.08	ND	0.53
2	Apr-99	15.3	7.88	33.1	8.1	0.0	1.2	0.09	0.03	1.24
2	Jul-99	21.7	7.29	34.5	8.1	0.0	1.2	ND	ND	ND
2	Oct-99	18.5	6.49	33.4	8.1	0.0	0.9	0.08	ND	ND
3	Jan-99	13.7	7.75	33.9	8.3	0.0	2.4	0.09	0.02	ND
3	Apr-99	14.7	8.86	34.1	8.1	0.0	2.1	0.11	0.03	5.59
3	Jul-99	21.3	7.46	34.6	8.1	0.0	0.9	ND	0.05	ND
3	Oct-99	18.0	7.13	33.1	8.1	0.0	1.7	0.08	ND	ND
4	Jan-99	13.8	7.74	33.5	8.3	0.0	3.0	0.09	0.05	ND
4	Apr-99	14.2	9.94	34.4	8.6	0.0	1.5	0.09	0.03	2.07
4	Jul-99	22.1	7.33	34.5	8.1	0.0	1.8	ND	ND	0.67
4	Oct-99	17.4	6.56	33.3	8.1	0.0	1.5	0.08	ND	ND
5	Jan-99	14.1	7.71	33.9	8.3	0.0	2.7	0.10	ND	ND
5	Apr-99	14.9	8.36	34.1	8.1	0.0	1.9	0.08	0.03	ND
5	Jul-99	25.1	6.73	34.4	8.2	7.1	1.2	0.02	ND	0.70
5	Oct-99	17.6	6.69	33.2	8.0	1.8	1.7	0.08	ND	ND

* Secchi disk was still in view when it hit the bottom, so Secchi depths may be underestimated.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (bottom waters 1999).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-99	11.7	7.83	33.1	8.2	0.0
	Apr-99	16.1	7.55	33.2	NR	0.0
	Jul-99	24.6	5.75	35.0	7.8	16.1
	Oct-99	19.9	6.58	33.0	7.9	6.3
2	Jan-99	13.0	7.71	33.7	8.3	6.1
	Apr-99	15.0	7.90	33.2	NR	1.5
	Jul-99	21.5	7.17	34.8	8.1	0.0
	Oct-99	18.0	6.61	32.8	8.1	0.0
3	Jan-99	13.6	7.79	33.7	8.3	0.0
	Apr-99	14.0	9.56	34.1	NR	0.0
	Jul-99	21.4	7.42	34.7	8.1	2.8
	Oct-99	17.7	7.48	32.9	8.1	2.8
4	Jan-99	13.5	7.64	33.5	8.3	0.0
	Apr-99	13.7	9.86	34.4	NR	0.0
	Jul-99	21.0	7.74	34.7	7.8	0.0
	Oct-99	16.9	7.22	33.0	8.1	0.0
5	Jan-99	13.0	7.09	33.8	8.3	0.0
	Apr-99	13.8	9.92	34.4	NR	0.0
	Jul-99	20.9	7.86	34.6	7.9	0.0
	Oct-99	17.6	6.98	33.0	7.9	0.0

NR = not recorded.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (surface waters 2001).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)	Secchi Depth (m)	Nitrate (mg/L)	Ortho-phosphate (mg/L)	Chlorophyll a (mg/m³)
1	Jan-01	13.1	9.05	31.8	7.9	0.0	0.9	0.20	ND	NA
1	Apr-01	17.4	7.53	23.4	8.5	0.0	1.1	0.80	0.13	NA
1	Jul-01	24.4	5.06	34.4	NR	0.0	0.6	0.20	ND	NA
1	Oct-01	22.1	10.28	31.9	NR	0.0	0.76*	0.30	0.05	NA
2	Jan-01	13.0	8.29	32.1	7.9	0.0	1.2	0.30	ND	NA
2	Apr-01	17.6	7.80	28.6	8.4	0.0	1.4	0.80	0.06	NA
2	Jul-01	22.5	6.53	34.7	NR	30.1	0.8	0.30	ND	NA
2	Oct-01	21.4	9.11	32.1	NR	0.9	1.4	0.20	0.05	NA
3	Jan-01	13.1	8.73	32.4	8.0	0.0	1.5	0.30	ND	NA
3	Apr-01	17.5	9.66	30.0	8.5	0.0	1.8	0.80	0.05	NA
3	Jul-01	21.6	8.10	34.4	NR	23.7	0.9	0.30	ND	NA
3	Oct-01	20.8	8.71	32.5	NR	0.0	1.1	0.30	ND	NA
4	Jan-01	13.7	8.47	33.2	8.0	0.0	1.2	0.30	ND	NA
4	Apr-01	16.8	7.26	32.9	8.4	0.0	1.4	0.90	ND	NA
4	Jul-01	18.7	9.94	33.9	NR	155.0	1.5	0.30	ND	NA
4	Oct-01	19.1	8.82	33.0	NR	0.0	1.8	0.30	ND	NA
5	Jan-01	14.6	9.30	33.6	8.1	0.0	1.7	0.10	ND	NA
5	Apr-01	16.8	7.23	33.7	8.4	0.0	2.1	0.90	ND	NA
5	Jul-01	21.2	8.41	33.9	NR	282.0	2.4	0.30	ND	NA
5	Oct-01	19.9	7.97	32.9	NR	0.0	2.1	0.30	ND	NA

* Secchi disk was still in view when it hit the bottom, so Secchi depths may be underestimated.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (bottom waters 2001).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-01	12.9	9.31	32.5	7.8	0.0
	Apr-01	18.6	6.51	28.1	7.8	4.0
	Jul-01	24.2	4.69	33.8	NR	17.7
	Oct-01	22.1	9.80	31.8	NR	3.8
2	Jan-01	13.0	8.89	32.6	7.9	0.0
	Apr-01	17.3	7.03	30.5	8.4	4.6
	Jul-01	22.1	4.42	33.7	NR	5.3
	Oct-01	21.4	9.02	32.4	NR	0.6
3	Jan-01	13.1	8.63	32.7	8.0	0.0
	Apr-01	17.5	9.47	29.1	8.5	0.0
	Jul-01	20.0	7.38	34.3	NR	0.5
	Oct-01	20.8	8.45	32.7	NR	4.9
4	Jan-01	14.4	8.56	33.4	8.0	0.0
	Apr-01	16.0	7.67	33.7	8.3	0.0
	Jul-01	17.8	9.48	34.1	NR	20.7
	Oct-01	19.1	8.89	32.9	NR	0.0
5	Jan-01	13.8	9.39	33.4	8.0	0.0
	Apr-01	16.5	8.00	33.5	8.4	0.0
	Jul-01	18.1	10.04	34.1	NR	15.6
	Oct-01	18.5	9.81	32.9	NR	0.0

NR = not recorded.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (sur

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-05	15.8	10.20	25.7	7.9	0.5
1	Apr-05	23.7	9.65	30.9	8.3	9.9
1	Jul-05	27.2	9.30	31.6	8.2	9.5
1	Oct-05	18.8	4.80	29.5	8.1	0.0
2	Jan-05	15.1	9.50	28.1	8.0	8.4
2	Apr-05	21.5	9.00	32.0	8.2	9.9
2	Jul-05	24.2	6.10	33.9	8.2	7.4
2	Oct-05	17.9	6.60	33.1	8.2	0.0
3	Jan-05	14.5	11.30	29.6	8.0	0.0
3	Apr-05	20.3	8.80	32.3	8.2	0.6
3	Jul-05	23.8	5.70	34.0	8.2	0.0
3	Oct-05	18.9	7.50	31.4	7.7	0.0
4	Jan-05	14.0	8.46	29.7	7.9	0.0
4	Apr-05	18.2	9.70	33.6	8.2	0.0
4	Jul-05	20.8	7.95	34.3	8.2	0.0
4	Oct-05	18.4	7.60	33.0	8.2	0.0
5	Jan-05	15.1	8.52	33.6	7.9	7.6
5	Apr-05	18.6	9.60	34.0	8.2	0.0
5	Jul-05	22.5	4.24	33.9	8.0	0.0
5	Oct-05	18.5	6.80	33.8	6.8	0.0

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (bottom waters 2005).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-05	15.8	12.00	28.0	8.0	1.5
	Apr-05	23.4	9.56	31.3	8.3	19.9
	Jul-05	27.2	8.70	31.7	8.2	21.4
	Oct-05	18.5	4.70	29.7	8.0	0.0
2	Jan-05	15.5	11.90	31.7	8.1	6.1
	Apr-05	21.2	9.00	32.1	8.2	10.4
	Jul-05	23.2	5.90	34.1	8.2	3.6
	Oct-05	17.8	7.30	33.4	8.3	10.0
3	Jan-05	14.6	12.02	31.2	7.9	35.8
	Apr-05	18.9	10.30	33.3	8.2	3.2
	Jul-05	23.7	5.30	34.1	8.2	1.2
	Oct-05	18.9	7.50	31.3	8.1	0.0
4	Jan-05	15.1	7.76	33.3	7.9	0.0
	Apr-05	16.1	10.30	34.2	8.2	2.3
	Jul-05	20.9	7.87	34.3	8.2	0.0
	Oct-05	18.1	7.60	33.5	8.2	2.0
5	Jan-05	15.1	8.53	33.6	7.9	10.6
	Apr-05	18.0	10.30	34.0	8.3	0.0
	Jul-05	22.5	3.09	34.1	8.0	0.0
	Oct-05	17.5	7.10	33.8	7.1	0.0

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (surface waters 2006).

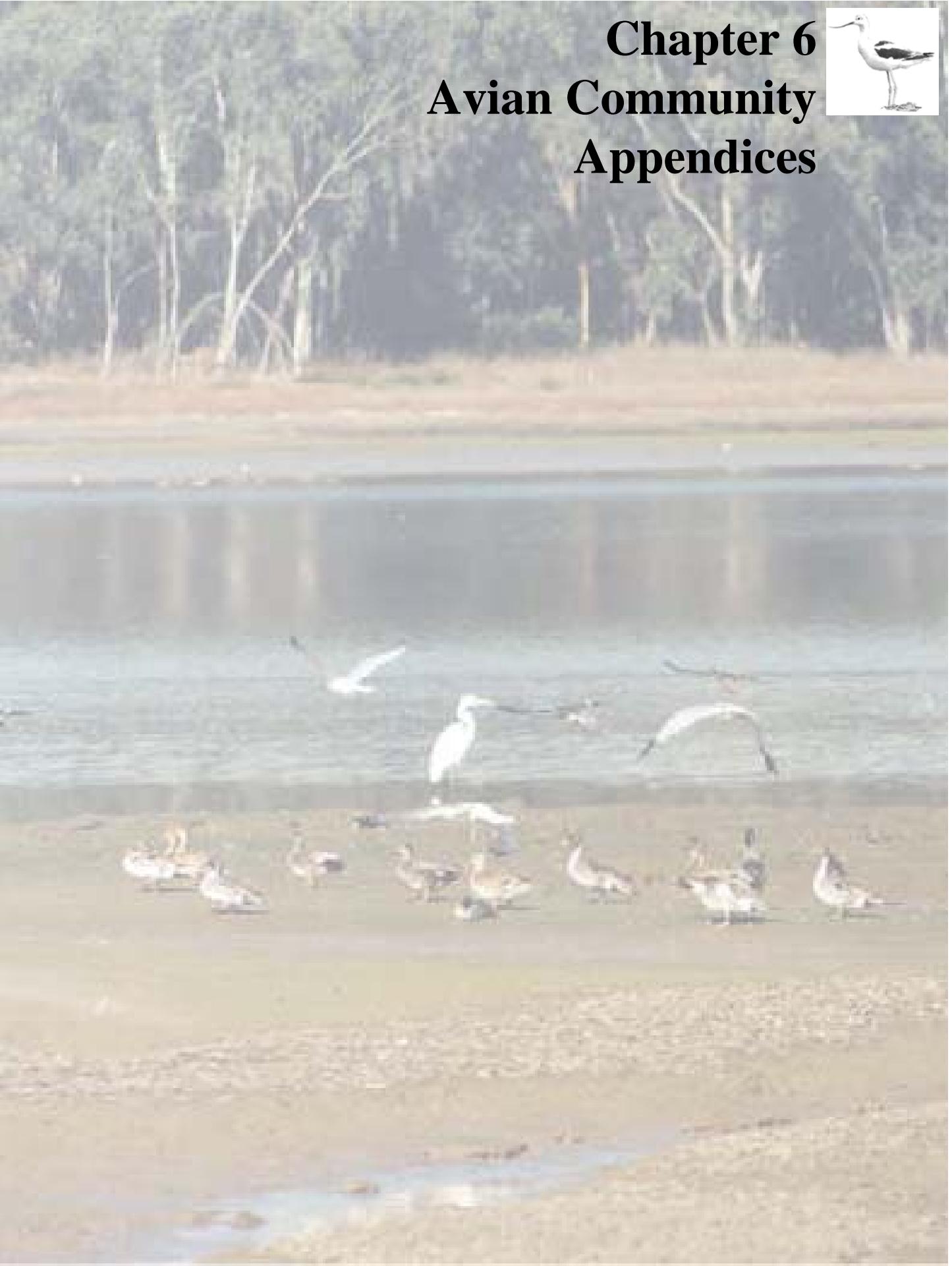
Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)	Secchi Depth (m)	Nitrate (mg/L)	Ortho-phosphate (mg/L)	Chlorophyll a (mg/m³)
1	Jan-06	12.6	9.50	27.5	8.0	4.7	0.5*			
1	Apr-06	17.7	6.60	28.1	7.8.	8.8	2.5	ND	0.15	8.00
1	Jul-06	31.4	5.40	31.8	7.8	39.0	6.0	ND	0.17	12.00
1	Oct-06	19.4	4.90	30.6	7.9	9.9	NR			
2	Jan-06	13.4	8.60	31.1	7.9	0.0	1.2*			
2	Apr-06	17.3	5.90	31.2	7.8	6.9	2.5	ND	ND	6.00
2	Jul-06	29.3	9.07	33.1	8.0	3.0	6.0	ND	0.22	3.00
2	Oct-06	19.1	5.20	32.9	8.0	5.5	NR			
3	Jan-06	13.9	9.50	32.9	8.0	0.0	1.1*			
3	Apr-06	16.1	7.70	32.8	7.9	0.0	4.0*	ND	ND	2.00
3	Jul-06	27.8	4.80	32.6	7.8	NR	4.5*	ND	0.15	2.00
3	Oct-06	19.1	5.20	32.5	8.0	5.2	5.0			
4	Jan-06	14.1	8.40	33.1	7.9	0.0	1.4*			
4	Apr-06	14.6	8.90	33.5	7.7	5.1	4.0*	ND	ND	2.00
4	Jul-06	27.0	5.10	33.1	7.9	NA	4.5*	ND	ND	<2
4	Oct-06	18.5	7.10	33.5	8.2	3.0	6*			
5	Jan-06	12.7	7.90	32.9	8.0	0.0	1.4*			
5	Apr-06	15.7	6.80	33.4	7.8	0.0	7.0*	ND	ND	4.00
5	Jul-06	25.7	5.80	33.3	7.9	NR	4.5*	ND	0.11	2.00
5	Oct-06	18.8	7.10	33.3	8.2	2.3	7.5*			

* Secchi disk was still in view when it hit the bottom, so Secchi depths may be underestimated.

Appendix A5-6. Water quality data collected coincident with fisheries monitoring (bottom waters 2006).

Station	Monitoring Quarter	Temp (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	pH (units)	Turbidity (NTU)
1	Jan-06	12.7	9.90	27.6	8.0	5.1
	Apr-06	17.7	5.40	31.0	7.8	10.4
	Jul-06	31.5	5.30	31.8	7.8	65.0
	Oct-06	19.2	4.50	32.0	7.9	12.8
2	Jan-06	13.3	8.70	31.0	7.9	0.0
	Apr-06	16.4	6.30	32.4	7.8	9.4
	Jul-06	28.9	8.75	33.3	8.0	10.7
	Oct-06	18.6	5.90	33.3	8.1	5.7
3	Jan-06	13.9	9.50	32.9	8.0	0.0
	Apr-06	16.0	7.70	32.8	7.9	0.0
	Jul-06	27.8	4.70	32.6	7.8	NM
	Oct-06	18.8	6.00	33.1	8.1	17.5
4	Jan-06	14.1	8.60	33.2	7.9	0.4
	Apr-06	14.6	8.90	33.5	8.0	3.4
	Jul-06	26.5	5.40	33.2	7.9	NM
	Oct-06	18.2	7.10	33.5	8.2	3.2
5	Jan-06	12.7	7.90	32.9	7.9	0.0
	Apr-06	14.6	7.70	33.5	7.9	3.8
	Jul-06	25.5	5.70	33.4	7.9	0.0
	Oct-06	18.1	7.80	33.6	8.2	2.8

NM = not measured due to equipment failure.



Chapter 6

Avian Community

Appendices



**Appendix A6-1. Post-restoration avian family, species, and individual counts
by survey date (1997 through 2006)**

Appendix A6-1. Post-restoration avian families, species, and individual counts by survey date (1997 through 2006).

Survey Date	Total Families	Total Species	Total Individuals
January 6, 1997	21	63	7,344
January 7, 1997	26	76	6,419
April 3, 1997	25	74	5,423
April 4, 1997	26	73	3,873
July 9, 1997	21	64	1,834
July 10, 1997	23	71	3,295
October 27, 1997	24	79	4,949
October 28, 1997	25	83	6,233
January 5, 1998	27	96	8,434
January 6, 1998	24	80	6,799
April 23, 1998	26	82	2,544
April 24, 1998	27	77	2,465
July 16, 1998	26	63	2,164
July 17, 1998	25	59	2,172
October 22, 1998	24	73	3,423
October 23, 1998	27	79	3,997
January 7, 1999	23	83	3,949
January 8, 1999	22	77	4,280
April 22, 1999	26	68	3,481
April 23, 1999	23	70	3,330
July 15, 1999	24	67	2,286
July 16, 1999	24	66	2,861
October 14, 1999	27	67	3,355
October 15, 1999	28	71	4,823
January 15, 2001	23	80	2,023
January 16, 2001	23	77	2,897
April 19, 2001	25	76	1,908
April 20, 2001	21	71	2,686
July 5, 2001	24	58	1,369
July 6, 2001	25	64	1,652
October 22, 2001	25	78	2,723
October 23, 2001	27	86	2,152
January 23, 2006	27	78	7,829
January 24, 2006	27	76	8,076
April 17, 2006	28	84	4,811
April 18, 2006	31	91	3,405
July 5, 2006	24	58	1,369
July 6, 2006	25	64	1,652
November 19, 2006	26	80	4,680
November 20, 2006	28	82	4,558

Appendix A6-2. Summary of bird counts by species by quarter (1997 through 2006)

Appendix A6-2. Summary of bird counts by species by quarter (averaged over two survey days per quarter).

SPECIES	1997				1998				1999				2001				2006			
	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01	Oct-01	Jan-06	Apr-06	Jul-06	Oct-06
Allen's Hummingbird									1								2			
American Avocet	38	69	8	1	184	106	3	2	95	56	6	13	44	22	23	8	31	19	4	18
American Bittern			1																	
American Coot	1,500	535	2	383	266	49	3	174	377	301	3	155	135	120		57	1,335	673	1	1,278
American Crow		2		1	2	1	1	5	5	9	7	20	2	4	1	5	35	5	1	57
American Goldfinch			3	2		1	1		1	1				1	2	2		1	2	
American Kestrel	1	1	1	5	2		1	4	3	1		4	1			2	4	1	1	2
American Pipit													1			1				
American White Pelican	1		1	2	1	1			1	1							37	8		
American Wigeon	420	4		28	41	28		8	263	10		5	194			94	786	25		479
Anna's Hummingbird	8	22	16	22	26	15	8	19	29	18	8	7	19	13	7	9	23	22	10	6
Ash-throated Flycatcher					1				1							1				
Baikal Teal																1				
Barn Swallow									6		6						6			
Belding's Savannah Sparrow	9	18	29	53	29	31	35	43	66	59	73	39	22	60	111	68	75	120	63	19
Belted Kingfisher*	2	1		8	6	2		8	4	2	1	6	3	2		5	5	1	2	
Bewick's Wren	1		1		1			3	1			1			4	3	2	3		1
Black Phoebe	9	5	14	8	5	3	12	16	3	4	7	8	3	3	14	16	3	8	14	14
Black Skimmer			42	21			62	12	5	26	9	21	8	30	15	4		15	6	
Black Turnstone				1																
Black-bellied Plover	21	9	7	42	41	14	9	74	58	32	33	61	37	45	6	61	66	15	15	50
Black-crowned Night Heron	1		4	2			1				1				2		2	1	2	
Black-headed Grosbeak			1			1			1	1								1		
Black-necked Stilt	4	20	32	13	15	33	6	2	3	10	18	12	4	11	9	5	10	12	21	4
Blue Grosbeak									1	1							1		1	
Blue-gray Gnatcatcher								4	1			2						1		
Blue-winged Teal																2		32		9
Bonaparte's Gull	26								1	1				10	10					
Brant								1	1	1									1	
Brewer's Blackbird			1											4				4	5	
Brown Pelican	1	1	21	2	19	7	8	13	20	6	7	7	17	5	16	4	1		1	5
Brown-headed Cowbird		10	12			6	1			5	7			3	19			11	16	
Bufflehead	27	39		8	58	1			56				62				93	3		37
Bullock's Oriole		1				1				3	1							1		
Bushtit	9	25	43	79	36	31	21	32	18	39	35	48	69	36	37	69	61	38	54	71
California Gnatcatcher	3	2	3	2	1	1	2	4	1	3	2	1	2	2	3	3	2	2	2	2
California Gull	5	1		7	85	6		22	9	7	4	4	53	38	2	2	64	38	2	31

* Species suspected of overcounting in some cases due to multiple sightings of wide ranging species that could not be conclusively determined as either unique or duplicate.

Appendix A6-2. Summary of bird counts by species by quarter (averaged over two survey days per quarter)(cont'd).

SPECIES	1997				1998				1999				2001				2006			
	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01	Oct-01	Jan-06	Apr-06	Jul-06	Oct-06
California Thrasher																	1	1		
California Towhee	1	4	2		8	4	3	5	3		1	4	1	2	4	6	3	2	3	2
Canada Goose					29				1		1		114			55	6			4
Canvasback						6	11	2		18	13	4		14	8		32	9	3	
Caspian Tern		6	3			2	1	2		2	1	1		3	1	2				
Cassin's Kingbird		1	3	4	2		2									3	1	1	1	
Cattle Egret	1						1													
Chipping Sparrow																				
Cinnamon Teal	49	44	4	19	11	14	1	5	16	11		1	5	12	4	44	17	1	14	
Clark's Grebe	6	7	1	3	6	9		1	2	1	2		5	2	1	1	1		1	2
Cliff Swallow		312	133	3		164	314	4		136	226	10		190	392		70	86		
Common Goldeneye												1								1
Common Loon					1	2	1					1	2	1	1					
Common Merganser						1											2			
Common Moorhen		1					1		1											
Common Raven	2	4	1	20		2	1	5	7	6	1	5	4	4	1	5	2	4		
Common Snipe	4			2	1								1		1					
Common Tern	1		1									1								
Common Yellowthroat	8	30	27	31	37	33	14	30	28	25	19	28	17	23	33	41	18	39	27	8
Cooper's Hawk		1			1		1				1	1	1				1	1	2	
Costa's Hummingbird			1		1															
Double-crested Cormorant	15	13	13	16	11	7	6	14	1		12	16	18	33	24	36	101	26	17	44
Dowitcher species	296	97	2		312	37	105	115	237	132	149	162	145	89	24	83	307	162	18	69
Downy Woodpecker		1								1										
Dunlin	9	19		18	6		2		1		9		1		2		6		9	
Eared Grebe	19	24	1	6	5	4		2	6	2		2	14	4		5	6		9	
Elegant Tern		20	193			81	18			5	2		30	7		492	4	3		
Eurasian Wigeon								1			1									
European Starling	1	46	1		1	4	6	2		3	2		3	1	1	1	8	10		
Forster's Tern	22	38	224	61	52	98	28	19	54	6	22	32	43	2	65	215	67	36	3	
Gadwall	70	144	12		40	111	1	7	89	119	6	6	143	51	40	3	222	63	12	178
Glaucous-winged Gull								1												
Great Blue Heron	6	3	9	11	8	4	8	12	6	6	11	8	8	7	9	10	7	9	21	12

* Species suspected of overcounting in some cases due to multiple sightings of wide ranging species that could not be conclusively determined as either unique or duplicate.

Appendix A6-2. Summary of bird counts by species by quarter (averaged over two survey days per quarter)(cont'd).

SPECIES	1997				1998				1999				2001				2006			
	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01	Oct-01	Jan-06	Apr-06	Jul-06	Oct-06
Great Egret	11	7	6	17	9	3	3	6	5	1	9	6	5	3	12	6	8	14	43	6
Greater Scaup					3															
Greater Yellowlegs	8	2	2	9	4	1	1	7	4		4	2	5	1		7	4		1	
Green Heron	1		7	5	1		4	1	1	1	5	1	1	1	8	2		1		
Green-Winged Teal	100	11		42	231	2		31	201	13	1	39	94	1		24	244	44		37
Heermann's Gull					1								1	3	1			1	7	
Herring Gull	1								1		4						1			1
Hooded Oriole			1				2													
Horned Grebe	6	1		1	4	1		1	1	3		3				1				1
Horned Lark																1				
House Finch	49	33	96	82	56	31	73	90	59	52	104	140	18	46	100	190	119	59	177	95
House Sparrow					2		2	4												
House Wren			1		1	1		1		1	1	1	2	1	3	5		1		1
Killdeer	74	24	87	44	46	42	44	41	70	30	63	64	27	40	64	50	19	20	28	73
Least Sandpiper	24	82	37	505	377	9	30	105	73	2	56	204	66	22	9	267	92	146	2	49
Least Tern			365			36	82			7	88			1	113	3		56		
Lesser Goldfinch		2	10	9			12	7		21	33	1		5	15	1	5	17	11	11
Lesser Scaup	78	18		1	40	2		44	42	5			1	28	1		1			
Lesser Yellowlegs	2	4	1	2	4	2	1	3	1				2			2		1	1	
Light-footed Clapper Rail															2	2	5	3	1	2
Lincoln's Sparrow					1															
Loggerhead Shrike																		1		
Long-billed Curlew		1	2	4	4		3	8	7	4	7	9	13	1	10	7	16	4	13	11
Long-billed Dowitcher		17		157	273	5							8			6				
Mallard	308	108	86	65	66	60	35	33	15	57	47	17	5	30	9	5	15	22	16	11
Marbled Godwit	5	1	7	34	33	11	21	70	74	56	47	77	71	46	32	23	116	94	12	64
Marsh Wren	5	22	12	21	13	21	12	28	35	38	4	19	11	28	24	42	15	70	23	32
Merlin					1			1	1				1			1	1	1		1
Mew Gull					1	2										5				
Mourning Dove	3	10	26	29	28	24	15	34	5	28	31	40	3	19	35	28	16	11	11	14
Northern Flicker	1				1															
Northern Harrier*	2		1	2	2			1	1	1			5	1	1		2			2
Northern Mockingbird	1	2	2		1			2	1		2	2	1	2	2	2		2	2	1
Northern Pintail	516			28	830			37	287			23	184			5	260	2	8	65
Northern Rough-winged Swallow	2	16	3	1	1				1						3			5	32	
Northern Shoveler	307	35		106	89	7		92	31	2		49	46	1		14	37	30		32
Nuttall's Woodpecker			1		1	1	1		1			1	1	1	1	1		4		2
Orange-crowned Warbler	1				1			1		2			1	1	1	1	2	1		

* Species suspected of overcounting in some cases due to multiple sightings of wide ranging species that could not be conclusively determined as either unique or duplicate.

Appendix A6-2. Summary of bird counts by species by quarter (averaged over two survey days per quarter)(cont'd).

SPECIES	1997				1998				1999				2001				2006						
	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01	Oct-01	Jan-06	Apr-06	Jul-06	Oct-06			
Osprey*	1			1	1	3	2	1	4	3	1	2	6	5	1	2	3	3	5	1	3		
Pacific Loon				1				1	1	1	1							1	1	1	1		
Pacific Slope Flycatcher					1		1			2		1						1	1	1	1		
Peregrine Falcon	2	2	1																1	1	1	1	
Pied-billed Grebe	30	23	10	13	6	4	2	5	2	1	2			14			5	14	2	1	23		
Purple Finch										1													
Purple Martin										1													
Red-throated Loon										1													
Red-breasted Merganser	4				10				1					8	3			1					
Red-necked Grebe			1																	1			
Red-necked Phalarope																				1			
Red-shouldered Hawk		2	1	3	2	1	2	3	2	2	1	4	2	1	2	1	3	2	5	1	2	2	
Red-tailed Hawk*	5	3	1	3	5	1	1	3	3	2	1	4	2	27	62	10	11	8	37	14	1		
Red-winged Blackbird	51	66	36	53	34	72	36	55	42	100	66	24	27	62	10	11	8	37	14	1			
Reddish Egret																	1						
Redhead	637	2		70	137	1											72	6	1	28			
Ring-billed Gull	163	20		25	127	10	16	20	59	21	1	13	85	69	1	13	140	13		154			
Ring-necked Duck	1								7				6										
Rock Dove					1						1												
Royal Tern			7		1		1		1									10		2	1		
Ruby-crowned Kinglet																		1	1				
Ruddy Duck	791	217	29	87	155	35	10	189	304	27	9	50	109	6	1	50	189	204			98		
Ruddy Turnstone					1	1					1												
Rufous Hummingbird										2													
Sanderling	29			111	48	4			13				2	1		119	5		38				
Say's Phoebe				5	3		5	3	1			4	1	1	1	5	3	3	1	4			
Scrub Jay	1			2	2	3	3	1	1		1		1	1	2	1	1	1	1	1	1		
Semipalmated Plover	18	65	61	182	152	101	71	79	66	176	97	9	10	120	37	6	126	122	25	20			
Sharp-shinned Hawk				1			1									1		1					
Short-billed Dowitcher	12	72	13	1										2		4							
Snowy Egret	59	21	32	16	12	9	41	11	3	9	35	16	6	16	24	20	4	42	32	8			
Song Sparrow	21	52	36	55	98	74	19	58	99	125	23	39	67	87	14	49	21	48	11	7			
Sora	1	1			1	1		7	2	4	1	4	1	2	2	2	2	2	2	2	2		
Spotted Sandpiper	1	1		17	1	4	1	4	1	4		2	2	2		3	1	1			2		

* Species suspected of overcounting in some cases due to multiple sightings of wide ranging species that could not be conclusively determined as either unique or duplicate.

Appendix A6-2. Summary of bird counts by species by quarter (averaged over two survey days per quarter)(cont'd).

SPECIES	1997				1998				1999				2001				2006			
	Jan-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01	Oct-01	Jan-06	Apr-06	Jul-06	Oct-06
Spotted Towhee				1												1			1	
Surf Scoter				1	3	68	8				1						1			
Thayer's Gull			2	3											1					
Tree Swallow															2					
Tri-colored Blackbird															1					
Turkey Vulture		1													4					
Unidentified Gull															1					
Unidentified Merganser	1																	1	1	5
Unidentified Sandpiper	282	400	8	58	459	3			634	349	62	234	952	34	43	7	16	139	142	493
Unidentified Scaup																	201	9		48
Unidentified Swallow	13																			
Unidentified Teal		1		60																
Unidentified Tern																				
Vaux's Swift																		1		
Violet-green Swallow	1	1			1		14													
Virginia Rail	1									1	2			3						
Warbling Vireo																		1		
Western Grebe	12	15	4	24	28	21			11	17	41	1	4	21	6	4	7		1	2
Western Gull	12	3	2	5	3	15	9	22	17	17	33	14	22	37	35	11	39	2	29	105
Western Kingbird	1	4	1	1			1			1	1	2						1	1	
Western Meadowlark									6			3					2			
Western Sandpiper	611	1,662	582	2,669	2,751	850	877	1,157	637	1,283	804	1,398	177	614	46	659	2,108	682	195	449
Western Snowy Plover		23	34	10	8	14	26		2		11			4	3		11	2	14	14
Western Tanager																1				
Whimbrel		1	15	6	1	7	24	7	7	12	10	17	8	18	12	13	10	14	6	6
White-faced Ibis	2				1	1				1	1					5			2	
White-crowned Sparrow	14	12		24	35				5	27	5		19	10	2		17	6	1	4
White-tailed Kite	1		3	4	1	1	1	3	4	1	2	3	3	4	1	1	1	1	2	
White-throated Swift								2		1							2			
Willet	26	17	13	70	61	23	31	100	101	59	68	116	46	43	46	91	134	158	71	117
Wilson's Warbler		1				1								1				1		
Wrentit	3	3	3	4			1	1			1			1	1	1	1	2	1	2
Yellow-breasted Chat											1								2	
Yellow-rumped Warbler	1	1		32	19			11	5			4	11			58	1	1		9
Yellowlegs Species	2	1			1			2			1	1			6	2		1		12
TOTAL NUMBER OF SPECIES	84	85	79	89	94	92	71	86	88	94	79	80	87	83	70	91	86	99	81	89
AVERAGE BIRD COUNT	6,884	4,648	2,565	5,591	7,619	2,505	2,168	3,710	4,116	3,406	2,574	4,089	2,460	2,298	1,511	2,440	7,953	4,108	1,269	4,619

Appendix A6-3. Total number of birds observed during post-restoration surveys listed by species in order of ascending abundance (1997, 1998, 1999, 2000, and 2006 combined)

Appendix A6-3. Total number of birds observed during post-restoration surveys listed by species in ascending order of abundance (1997, 1998, 1999, 2001, and 2006 combined).

American Bittern	1	Brant	3	Yellowlegs Species	25	Cinnamon Teal	268
Baikal Teal	1	Greater Scaup	3	Sora	27	Black Skimmer	273
Black Turnstone	1	Turkey Vulture	3	American Kestrel	30	Anna's Hummingbird	302
Cattle Egret	1	Merlin	5	White-tailed Kite	35	Sanderling	368
Common Goldeneye	1	White-throated Swift	5	Green Heron	36	California Gull	374
Glaucous-winged Gull	1	Peregrine Falcon	5	Say's Phoebe	36	Bufflehead	382
Lincoln's Sparrow	1	Bullock's Oriole	6	California Gnatcatcher	38	Mourning Dove	405
Purple Martin	1	Hooded Oriole	6	No. Rough-winged Swallow	38	Snowy Egret	411
Thayer's Gull	1	Virginia Rail	6	Osprey	39	Double-crested Cormorant	419
Vaux's Swift	1	Pacific Slope Flycatcher	7	Spotted Sandpiper	41	Western Gull	427
Warbling Vireo	1	Mew Gull	7	Red-tailed Hawk	44	Long-billed Dowitcher	464
Western Tanager	1	Pacific Loon	7	Clark's Grebe	46	Marsh Wren	468
Blue Grosbeak	1	Tri-colored Blackbird	7	Bonaparte's Gull	47	Common Yellowthroat	511
California Thrasher	1	Cooper's Hawk	7	Blue-winged Teal	49	Black-bellied Plover	694
Chipping Sparrow	1	House Sparrow	7	American White Pelican	51	American Avocet	744
Downy Woodpecker	1	Common Loon	8	California Towhee	53	Least Tern	748
Eurasian Wigeon	1	Common Snipe	8	Belted Kingfisher	55	Red-winged Blackbird	799
Northern Flicker	1	Canada Goose	9	Unidentified Gull	56	Bushtit	846
Red-throated Loon	1	Tree Swallow	9	Greater Yellowlegs	58	Elegant Tern	851
Red-necked Grebe	1	Western Kingbird	10	Unidentified Tern	60	Northern Shoveler	875
Red-necked Phalarope	1	Western Meadowlark	10	Common Raven	70	Marbled Godwit	891
Reddish Egret	1	Orange-crowned Warbler	12	Dunlin	79	Killdeer	947
Unidentified Merganser	1	White-faced Ibis	12	Surf Scoter	80	Ring-billed Gull	947
American Pipit	2	Light-footed Clapper Rail	12	European Starling	88	Redhead	952
Ash-throated Flycatcher	2	Brewer's Blackbird	13	Brown-headed Cowbird	89	Song Sparrow	996
Blue-gray Gnatcatcher	2	Nuttall's Woodpecker	13	Short-billed Dowitcher	103	Mallard	1007
Common Moorhen	2	American Goldfinch	13	Eared Grebe	107	Belding's Savannah Sp.	1018
Costa's Hummingbird	2	Heermann's Gull	13	Long-billed Curlew	119	Forster's Tern	1082
Horned Lark	2	Unidentified Swallow	13	Caspian Tern	123	Green-Winged Teal	1111
Loggerhead Shrike	2	Black-crowned Night Heron	14	Yellow-rumped Warbler	151	Gadwall	1311
Purple Finch	2	Ring-necked Duck	14	Pied-billed Grebe	151	Willet	1387
Rufous Hummingbird	2	House Wren	16	Lesser Goldfinch	156	Semipalmated Plover	1537
Spotted Towhee	2	Barn Swallow	17	Brown Pelican	157	House Finch	1665
Common Merganser	2	Northern Harrier	17	American Crow	159	Cliff Swallow	2035
Herring Gull	2	Violet-green Swallow	17	Black Phoebe	163	Least Sandpiper	2152
Ruby-crowned Kinglet	2	Scrub Jay	18	Great Blue Heron	170	Northern Pintail	2235
Sharp-shinned Hawk	2	Bewick's Wren	18	Western Snowy Plover	171	American Wigeon	2381
Yellow-breasted Chat	2	Wrentit	20	Great Egret	174	Dowitcher species	2536
Allen's Hummingbird	3	Horned Grebe	20	White-crowned Sparrow	177	Ruddy Duck	2557
Black-headed Grosbeak	3	Red-shouldered Hawk	20	Whimbrel	190	Unidentified Sandpiper	4310
Common Tern	3	Northern Mockingbird	22	Canvasback	207	American Coot	7341
Rock Dove	3	Lesser Yellowlegs	24	Western Grebe	216	Western Sandpiper	20205
Ruddy Turnstone	3	Royal Tern	24	Black-necked Stilt	240		
Unidentified Teal	3	Cassin's Kingbird	25	Unidentified Scaup	257		
Wilson's Warbler	3	Red-breasted Merganser	25	Lesser Scaup	258		

**Appendix A6-4. List of unique bird species observed at Batiquitos Lagoon
pre- and post- restoration**

Appendix A6-4. List of unique bird species observed at Batiquitos Lagoon pre- and post-restoration.

Species Observed in Pre-Restoration Surveys ¹ (1987-1996) but not in Post-Restoration Surveys ²	Species Observed in Post-Restoration Surveys ² (1997-2006) but not in Pre-Restoration Surveys ¹
Least Bittern	Common Loon
Snow Goose	Red-throated Loon
Tundra Swan	Red-necked Grebe
California Quail	Reddish Egret
Baird's Sandpiper	Common Merganser
Red Knot	Common Goldeneye
Pectoral Sandpiper	Peregrine Falcon
Red Phalarope	Ruddy Turnstone
Wilson's Phalarope	Mew Gull
Black Tern	Glaucous-winged Gull
Spotted Dove	Thayer's Gull
Greater Roadrunner	Purple Martin
Common Barn Owl	Chipping Sparrow
Black-chinned Hummingbird	Blue Grosbeak
Olive-sided Flycatcher	Purple Finch
Western Wood Peewee	
Willow Flycatcher	
Hutton's Vireo	
Solitary Vireo	
Bank Swallow	
Cactus Wren	
Hermit Thrush	
American Robin	
Cedar Waxwing	
Phainopepla	
Fox Sparrow	
Lark Sparrow	
Rufous-crowned Sparrow	
Yellow-headed Blackbird	
Rose-breasted Grosbeak	

¹ Michael Brandman Associates, Inc. 1988b

¹ MEC 1990

¹ Audubon Society Bird Counts 1991-1993

¹ WRA 1995

¹ Audubon Society Bird Counts 1995-1997

² Merkel & Associates 1998

² Merkel & Associates 1999

² Merkel & Associates 2000

² Merkel & Associates 2002

Appendix A6-5. Avian guilds

Appendix A6-5. Avain guilds.

GUILD 1 - SMALL SHOREBIRDS	GUILD 3 - WADING/MARSHBIRDS																																														
Charadriidae (Plovers and Relatives) <table> <tr><td>Black-bellied Plover</td><td><i>Pluvialis squatarola</i></td></tr> <tr><td>Snowy Plover</td><td><i>Charadrius alexandrinus</i></td></tr> <tr><td>Semipalmated Plover</td><td><i>Charadrius semipalmatus</i></td></tr> <tr><td>Killdeer</td><td><i>Charadrius vociferus</i></td></tr> </table>	Black-bellied Plover	<i>Pluvialis squatarola</i>	Snowy Plover	<i>Charadrius alexandrinus</i>	Semipalmated Plover	<i>Charadrius semipalmatus</i>	Killdeer	<i>Charadrius vociferus</i>	Ardeidae (Herons and Bitterns) <table> <tr><td>American Bittern</td><td><i>Botaurus lentiginosus</i></td></tr> <tr><td>Great Blue Heron</td><td><i>Ardea herodias</i></td></tr> <tr><td>Great Egret</td><td><i>Ardea alba</i></td></tr> <tr><td>Snowy Egret</td><td><i>Egretta thula</i></td></tr> <tr><td>Reddish Egret</td><td><i>Egretta rufescens</i></td></tr> <tr><td>Cattle Egret</td><td><i>Bubulcus ibis</i></td></tr> <tr><td>Green Heron</td><td><i>Butorides virescens</i></td></tr> <tr><td>Striated Heron</td><td><i>Butorides striata</i></td></tr> <tr><td>Black-crowned Night heron</td><td><i>Nycticorax nycticorax</i></td></tr> </table>	American Bittern	<i>Botaurus lentiginosus</i>	Great Blue Heron	<i>Ardea herodias</i>	Great Egret	<i>Ardea alba</i>	Snowy Egret	<i>Egretta thula</i>	Reddish Egret	<i>Egretta rufescens</i>	Cattle Egret	<i>Bubulcus ibis</i>	Green Heron	<i>Butorides virescens</i>	Striated Heron	<i>Butorides striata</i>	Black-crowned Night heron	<i>Nycticorax nycticorax</i>																				
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Appendix A6-5. Avain guilds (cont'd).

GUILD 5 - WATERFOWL		GUILD 5 - WATERFOWL (cont'd)	
Gaviidae (Loons)		Pelecanidae (Pelicans)	
Red-throated Loon	<i>Gavia stellata</i>	Am. White Pelican	<i>Pelecanus erythrorhynchos</i>
Pacific Loon	<i>Gavia pacifica</i>		
Common Loon	<i>Gavia immer</i>		
Podicipedidae (Grebes)		Rallidae (Rails, Gallinules, and Coots)	
Pied-billed Grebe	<i>Podilymbus podiceps</i>	American Coot	<i>Fulica americana</i>
Horned Grebe	<i>Podiceps auritus</i>		
Red-necked Grebe	<i>Podiceps grisegena</i>		
Eared Grebe	<i>Podiceps nigricollis</i>		
Western Grebe	<i>Aechmophorus occidentalis</i>		
Clark's Grebe	<i>Aechmophorus clarkii</i>		
Phalacrocoracidae (Cormorants)		GUILD 6 - GULLS	
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Laridae (Gulls)	
Anatidae (Swans, Geese, and Ducks)		Bonaparte's Gull	<i>Larus philadelphia</i>
Brant	<i>Branta bernicla</i>	Heernman's Gull	<i>Larus heermanni</i>
Canada Goose	<i>Branta canadensis</i>	Mew Gull	<i>Larus canus</i>
Gadwall	<i>Anas strepera</i>	Ring-billed Gull	<i>Larus delawarensis</i>
Eurasian Wigeon	<i>Anas penelope</i>	California Gull	<i>Larus californicus</i>
American Wigeon	<i>Anas americana</i>	Herring Gull	<i>Larus argentatus</i>
Mallard	<i>Anas platyrhynchos</i>	Thayer's Gull	<i>Larus thayeri</i>
Blue-winged Teal	<i>Anas discors</i>	Western Gull	<i>Larus occidentalis</i>
Cinnamon Teal	<i>Anas cyanoptera</i>	Glaucous-winged Gull	<i>Larus glaucescens</i>
Northern Shoveler	<i>Anas clypeata</i>	Unidentified Gull	<i>Larus sp.</i>
Northern Pintail	<i>Anas acuta</i>		
Baikal Teal	<i>Anas formosa</i>		
Green-winged Teal	<i>Anas crecca</i>		
Unidentified Teal	<i>Anas sp.</i>		
Canvasback	<i>Aythya valisineria</i>	GUILD 7 - RAPTORS	
Redhead	<i>Aythya americana</i>	Cathartidae (American Vultures)	
Ring-necked Duck	<i>Aythya collaris</i>	Turkey Vulture	<i>Cathartes aura</i>
Greater Scaup	<i>Aythya marila</i>	Accipitridae (Hawk, Old World Vultures, and Harriers)	
Lesser Scaup	<i>Aythya affinis</i>	Osprey	<i>Pandion haliaetus</i>
Unidentified Scaup	<i>Aythya sp.</i>	White-tailed Kite	<i>Elanus leucurus</i>
Surf Scoter	<i>Melanitta perspicillata</i>	Sharp-shinned Hawk	<i>Accipiter striatus</i>
Bufflehead	<i>Bucephala albeola</i>	Cooper's Hawk	<i>Accipiter cooperii</i>
Common Goldeneye	<i>Bucephala clangula</i>	Red-shouldered Hawk	<i>Buteo lineatus</i>
Common Merganser	<i>Mergus merganser</i>	Red-tailed Hawk	<i>Buteo jamaicensis</i>
Red-breasted Merganser	<i>Mergus serrator</i>	Falconidae (Caracaras and Falcons)	
Unidentified Merganser	<i>Mergus sp.</i>	American Kestrel	<i>Falco sparverius</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>	Merlin	<i>Falco columbarius</i>
		Peregrine Falcon	<i>Falco peregrinus</i>

Appendix A6-5. Avain guilds (cont'd).

GUILD 8 - UPLAND BIRDS		GUILD 8 (cont'd)	
Columbidae (Pigeons and Doves)		Fringillidae (Finches)	
Rock Pigeon	<i>Columba livia</i>	Purple Finch	<i>Carpodacus purpureus</i>
Mourning Dove	<i>Zenaida macroura</i>	House Finch	<i>Carpodacus mexicanus</i>
Apodidae (Swifts)		Lesser Goldfinch	<i>Carduelis psaltria</i>
Vaux's Swift	<i>Chaetura vauxi</i>	American Goldfinch	<i>Carduelis tristis</i>
White-throathed Swift	<i>Aeronautes saxatalis</i>		
Trochilidae (Hummingbirds)		Tyrannidae (Tyrant Flycatchers)	
Anna's Hummingbird	<i>Calypte anna</i>	Pacific-slope Flycatcher	<i>Empidonax difficilis</i>
Costa's Hummingbird	<i>Calypte costae</i>	Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Allen's Hummingbird	<i>Selasphorus sasin</i>	Black Phoebe	<i>Sayornis nigricans</i>
Rufous Hummingbird	<i>Selasphorus rufus</i>	Say's Phoebe	<i>Sayornis saya</i>
Emberizidae (Warblers, Sparrows, Blackbirds and Rel.)		Cassin's Kingbird	<i>Tyrannus vociferans</i>
Orange-crowned Warbler	<i>Vermivora celata</i>	Western Kingbird	<i>Tyrannus verticalis</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Vireonidae (Vireos)	
Common Yellowthroat	<i>Geothlypis trichas</i>	Warbling Vireo	<i>Vireo gilvus</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>		
Yellow-breasted Chat	<i>Icteria virens</i>		
Western Tanager	<i>Piranga ludoviciana</i>		
Spotted Towhee	<i>Pipilo maculatus</i>		
California Towhee	<i>Pipilo crissalis</i>		
Chipping Sparrow	<i>Spizella passerina</i>		
Song Sparrow	<i>Melospiza melodia</i>		
Lincoln's Sparrow	<i>Melospiza lincolni</i>		
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>		
Blue Grosbeak	<i>Passerina caerulea</i>		
Western Meadowlark	<i>Sturnella neglecta</i>		
Red-winged Blackbird	<i>Agelaius phoeniceus</i>		
Tricolored Blackbird	<i>Agelaius tricolor</i>		
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>		
Brown-headed Cowbird	<i>Molothrus ater</i>		
Hooded Oriole	<i>Icterus cucullatus</i>		
Bullock's Oriole	<i>Icterus bullockii</i>		
House Sparrow	<i>Passer domesticus</i>		
Savannah Sparrow	<i>Passerculus sandwichensis</i>		
Belding's Savannah Sparrow	<i>Passerculus sandwichensis beldingi</i>		

Appendix A6-5. Avain guilds (cont'd).

GUILD 8 - UPLAND BIRDS (cont'd)

Alaudidae (Larks)

Horned Lark *Eremophila alpestris*

Hirundinidae (Swallows)

Purple Martin	<i>Progne subis</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Barn Swallow	<i>Hirundo rustica</i>
No. Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Unidentified Swallow	

Laniidae (Shrikes)

Loggerhead Shrike *Lanius ludovicianus*

Sturnidae (Starlings)

European Starling *Sturnus vulgaris*

Motacilidae (Pipits)

American Pipit *Anthus rubescens*

Troglodytidae (Wrens)

Bewick's Wren	<i>Thryomanes bewickii</i>
House Wren	<i>Troglodytes aedon</i>
Marsh Wren	<i>Cistothorus palustris</i>

Muscicapidae (Thrushes)

Ruby-crowned Kinglet	<i>Regulus calendula</i>
California Gnatcatcher	<i>Polioptila californica</i>

Mimidae (Mockingbirds and Thrashers)

Northern Mockingbird	<i>Mimus polyglottos</i>
California Thrasher	<i>Toxostoma redivivum</i>

Corvidae (Jays, Magpies, and Crows)

Scrub Jay	<i>Aphelocoma coerulescens</i>
American Crow	<i>Corvus brachyrhynchos</i>
Common Raven	<i>Corvus corax</i>

Muscicapidae (Gnatcatchers, Kinglets, Thrushes, Wrentit)

Blue-grey Gnatcatcher	<i>Polioptila caerulea</i>
California Gnatcatcher	<i>Polioptila californica californica</i>
Wrentit	<i>Chamaea fasciata</i>

Aegithalidae (Bushtit)

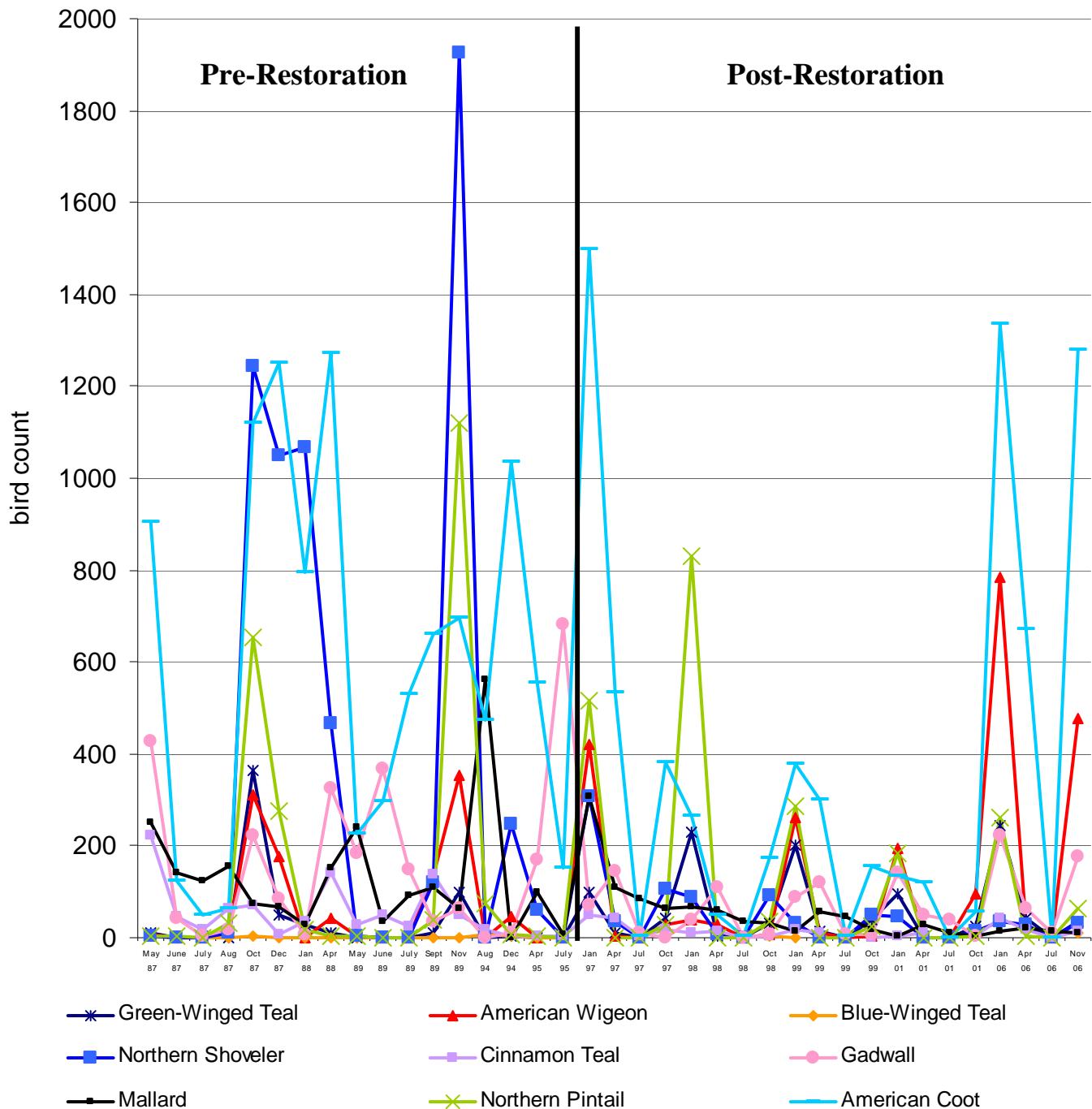
Bushtit	<i>Psaltriparus minimus</i>
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Picidae (Woodpeckers)

Nuttall's Woodpecker	<i>Picoides nuttallii</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Northern Flicker	<i>Colaptes auratus</i>

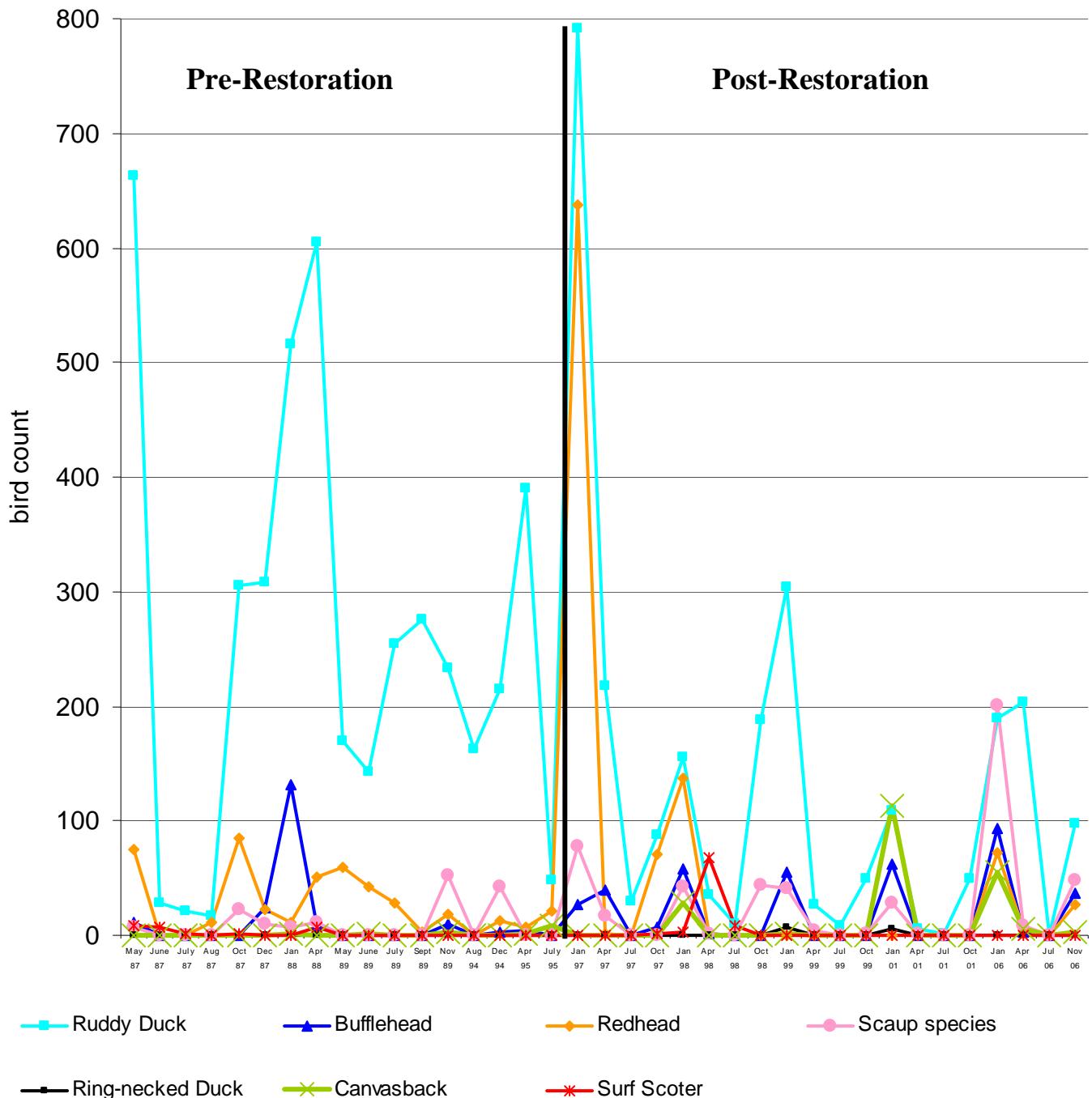
**Appendix A6-6. Abundance of dominant species by guild
during pre- and post-restoration surveys**

Abundance of Dabbling Duck Species and American Coot



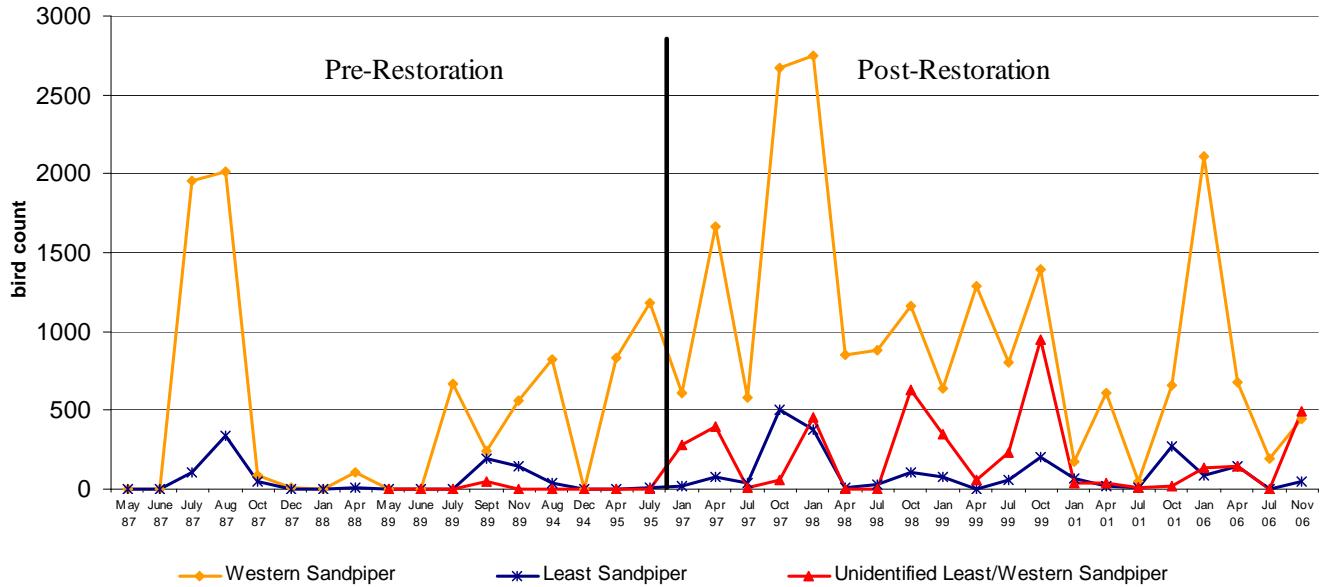
Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration survey data from present Merkel & Associates monitoring program.

Abundance of Dominant Diving Duck Species

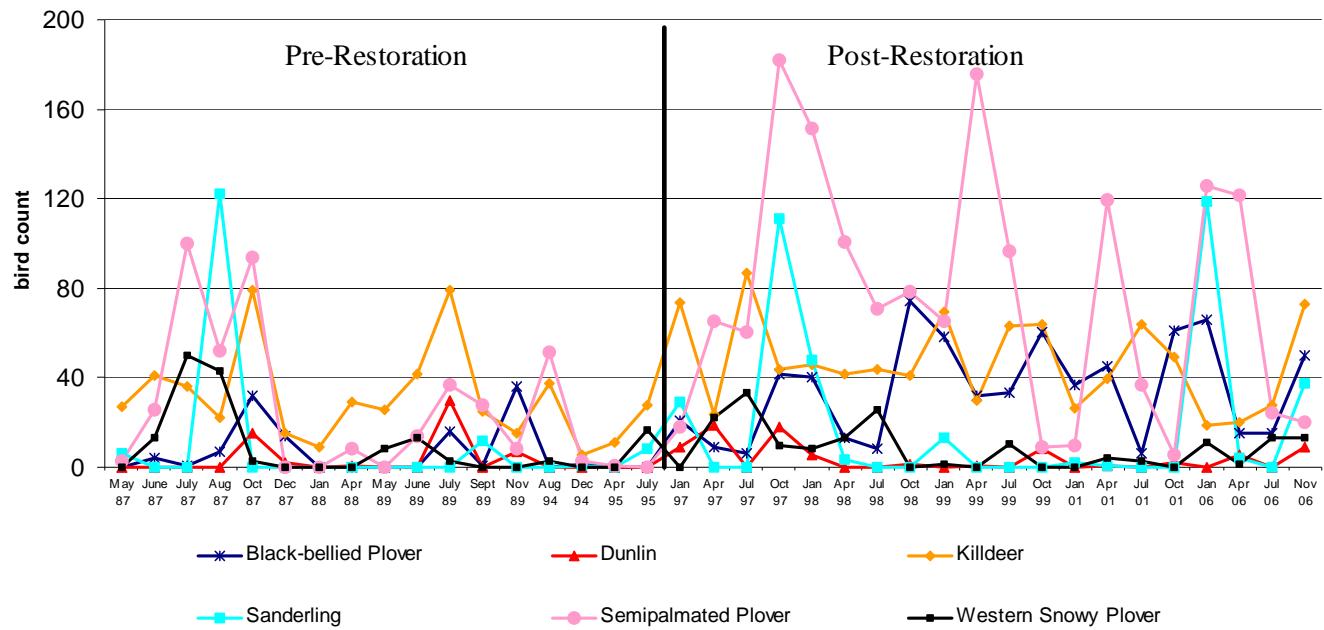


Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration survey data from present Merkel & Associates monitoring program.

Abundance of Western, Least, and Unid. Least/Western Sandpipers

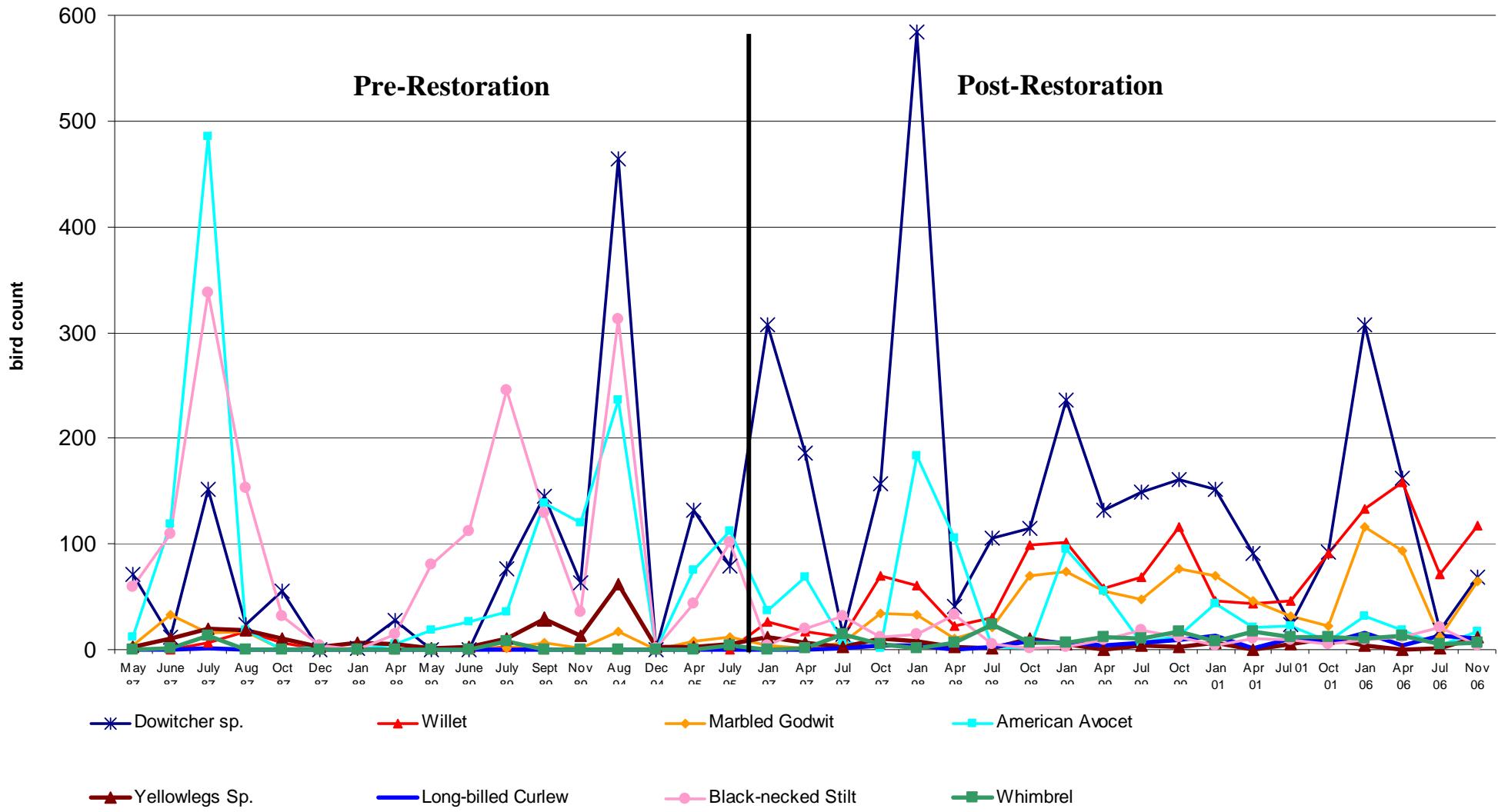


Abundance of Other Dominant Small Shorebird Species



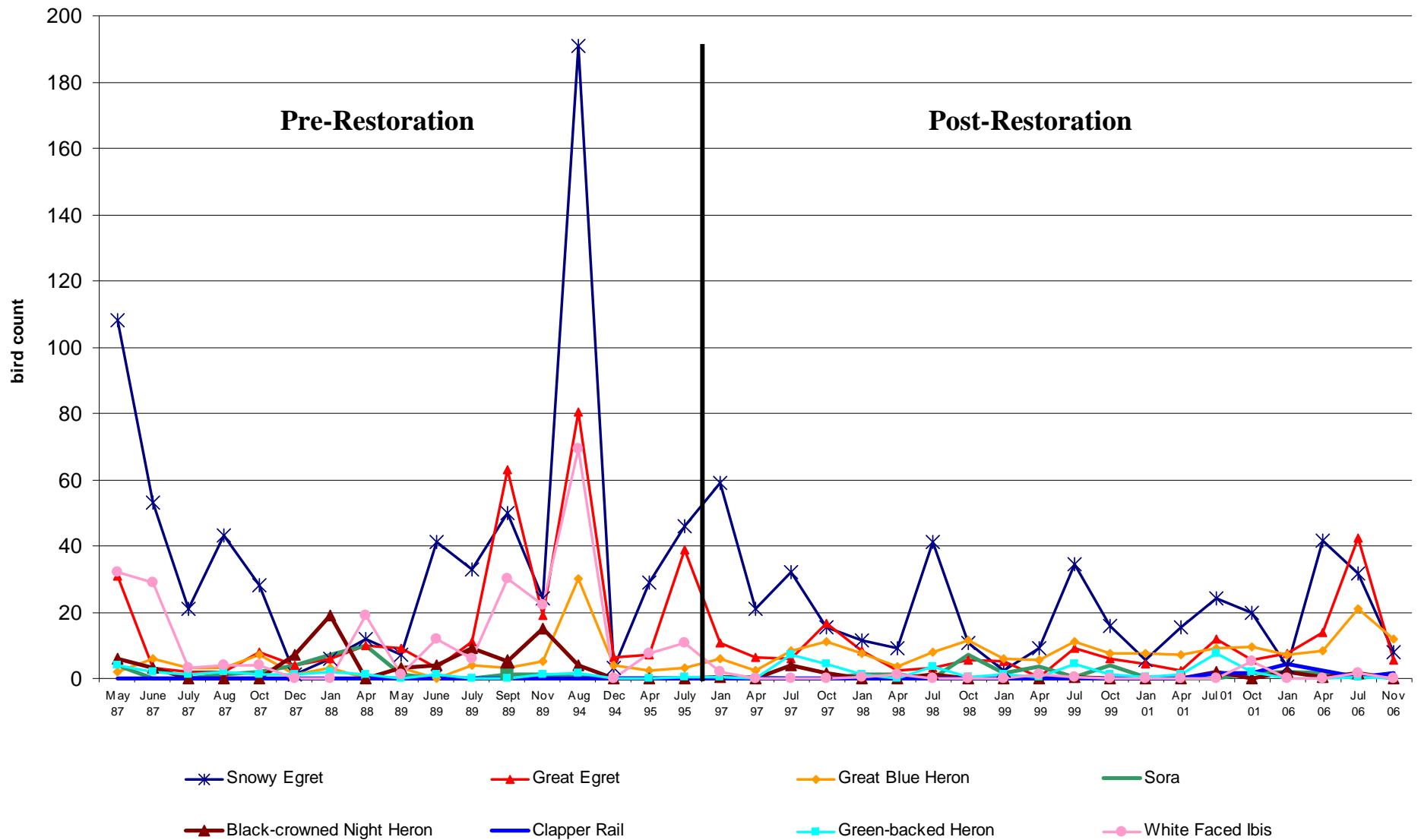
Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration survey data from present Merkel & Associates monitoring program.

Abundance of Dominant Large Shorebird Species



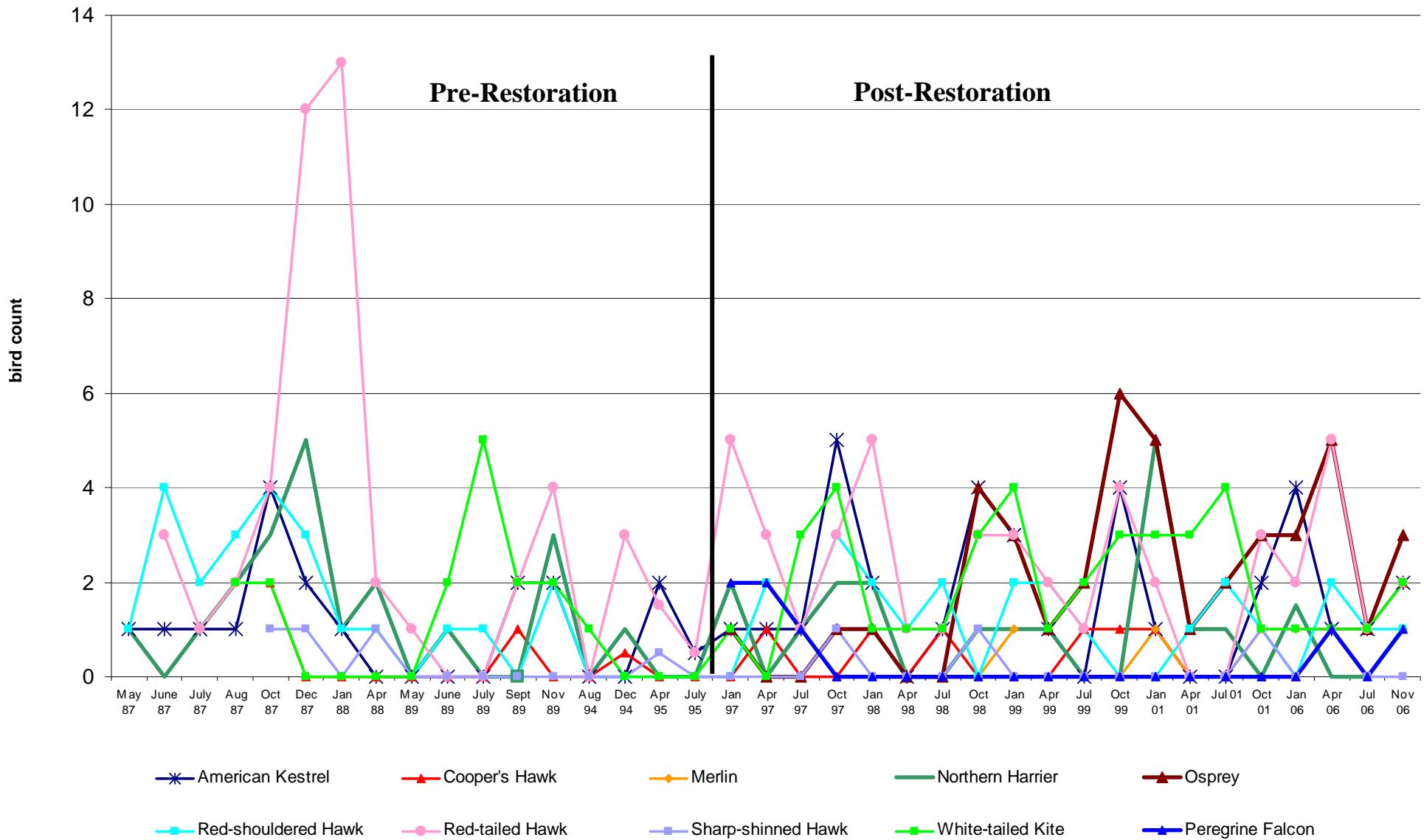
Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration data from present Merkel & Associates monitoring program.

Abundance of Dominant Wading Marshbirds



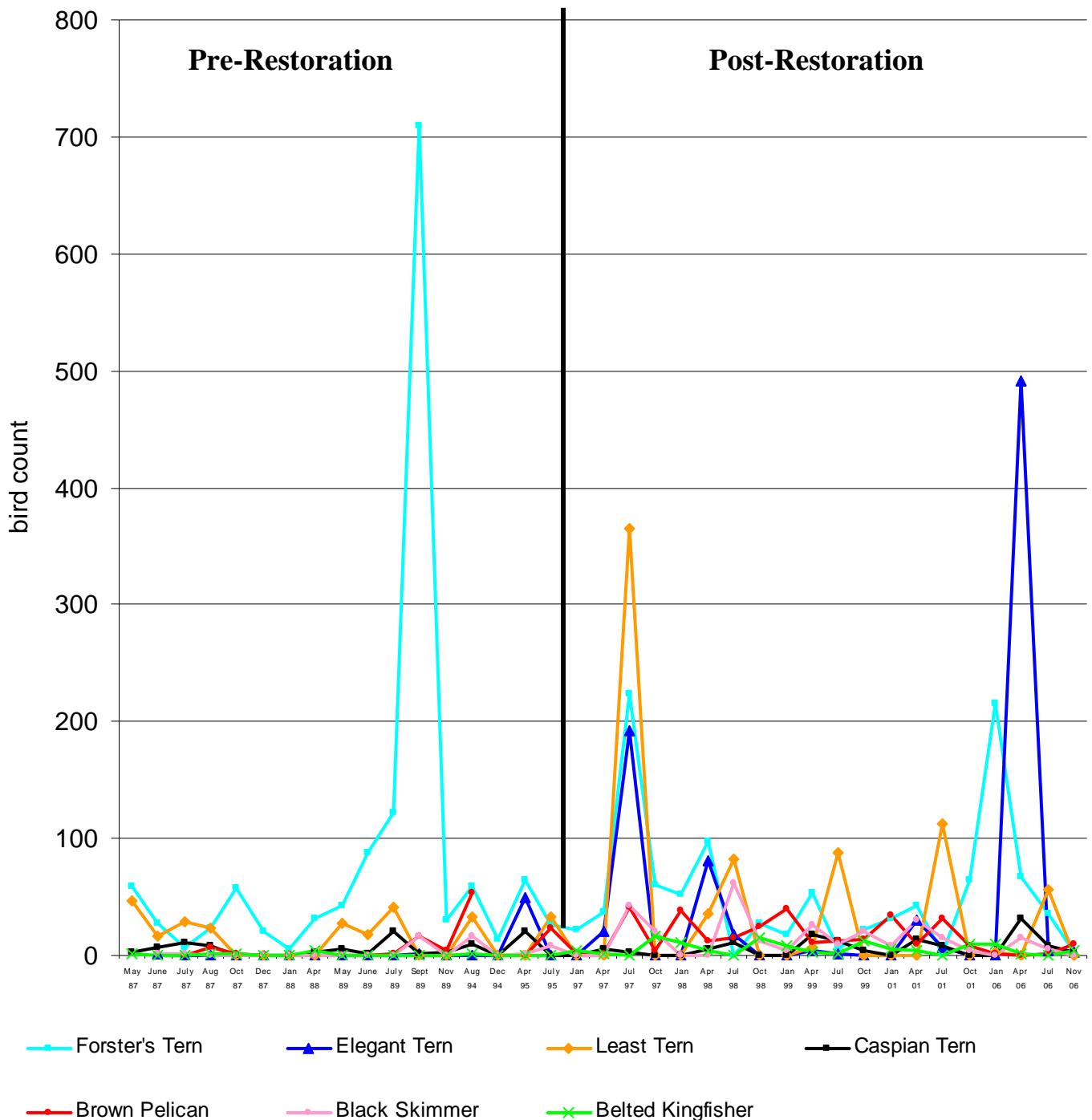
Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration data from present Merkel & Associates monitoring program.

Abundance of Dominant Raptor Species



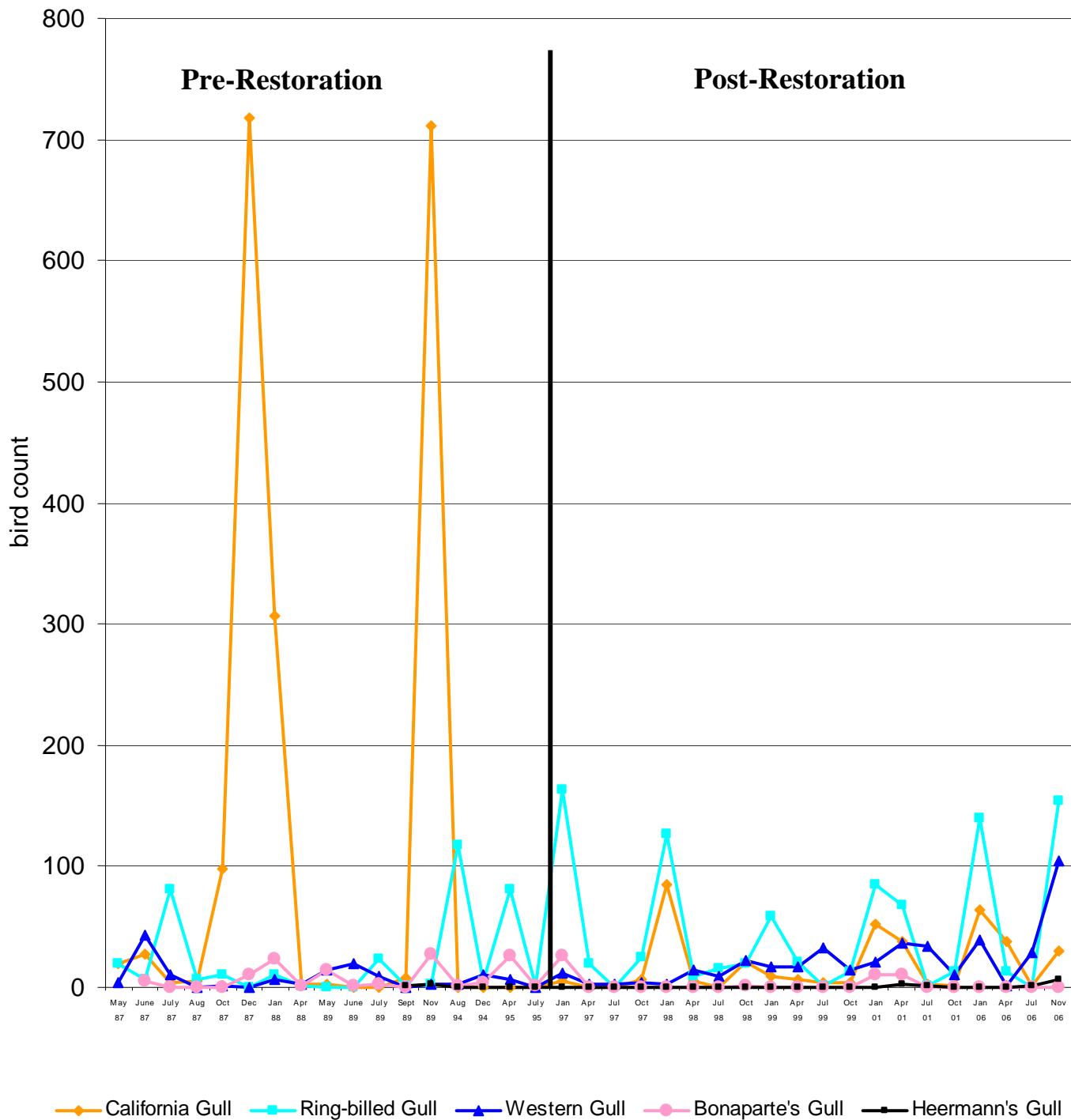
Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration data from present Merkel & Associates monitoring program.

Abundance of Dominant Aerial Fish Foragers



Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration data from present Merkel & Associates monitoring program.

Abundance of Dominant Gull Species



Pre-restoration survey data compiled from MBA 1988 (1987-88 data), MEC 1990 (1989 data), & WRA 1995 (1994-95 data). Post-restoration data from present Merkel & Associates monitoring program.

Appendix A6-7. Avian species observed within coastal wetlands of southern California

Appendix A6-7. Avian species observed within coastal wetlands of southern California.

Species		Wetland						
Common name	Scientific Name	Anaheim Bay ¹	Agua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Peñasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹	
Gaviidae (Loons)								
Arctic Loon	<i>Gavia arctica</i>			+	+	+		
Common Loon	<i>Gavia immer</i>	+	+	+	+	+	+	+
Pacific Loon	<i>Gavia pacifica</i>		+	+	+			+
Red-throated Loon	<i>Gavia stellata</i>	+		+	+			+
Podicipedidae (Grebes)								
Pied-billed Grebe	<i>Podilymbus podiceps</i>	+	+	+	+	+	+	+
Horned Grebe	<i>Podiceps auritus</i>	+	+	+	+			+
Eared Grebe	<i>Podiceps nigricollis</i>	+	+	+	+	+	+	+
Red-necked Grebe	<i>Podiceps grisegena</i>							+
Western Grebe	<i>Aechmophorus occidentalis</i>	+	+	+	+	+	+	+
Clark's Grebe	<i>Aechmophorus clarkii</i>	+	+	+	+			+
Pelecanidae (Pelicans)								
Brown Pelican	<i>Pelecanus occidentalis californicus</i>	+	+	+	+	+	+	+
American White Pelican	<i>Pelecanus erythrorhynchos</i>	+	+	+		+	+	+
Phalacrocoracidae (Cormorants)								
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	+	+	+	+	+	+	+
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>			+				
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>				+	+	+	+
Ardeidae (Heros and Bitterns)								
Reddish Egret	<i>Egretta rufescens</i>	+		+	+			+
Snowy Egret	<i>Egretta thula</i>	+	+	+	+	+	+	+
Little Blue Heron	<i>Egretta caerulea</i>			+				
Tricolored Heron	<i>Egretta tricolor</i>			+				
Great Egret	<i>Ardea alba</i>	+	+	+	+	+	+	+
Cattle Egret	<i>Bubulcus ibis</i>			+	+			+
Great Blue Heron	<i>Ardea herodias</i>	+	+	+	+	+	+	+
Green Heron	<i>Butorides virescens</i>	+	+	+	+	+	+	+
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	+	+	+	+	+	+	+
Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>			+				
American Bittern	<i>Botaurus lentiginosus</i>			+		+	+	+
Least Bittern	<i>Ixobrychus exilis</i>			+				
Threskiornithidae (Ibis and Spoonbills)								
White-faced Ibis	<i>Plegadis chihi</i>			+	+	+		+
Anatidae (Swans, Geese, and Ducks)								
Mallard	<i>Anas platyrhynchos</i>	+	+	+	+	+	+	+
Gadwall	<i>Anas strepera</i>		+	+	+			+
Green-winged Teal	<i>Anas crecca</i>	+	+	+	+	+	+	+
Baikal Teal	<i>Anas formosa</i>							+
Cinnamon Teal	<i>Anas cyanoptera</i>	+	+	+	+	+	+	+
Blue-winged Teal	<i>Anas discors</i>	+		+	+	+	+	+

Appendix A6-7. Avian species observed within coastal wetlands of southern California (cont'd).

Species		Wetland						
Common name	Scientific Name	Anaheim Bay ¹	Agua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Peñasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹	
American Wigeon	<i>Anas americana</i>	+	+	+	+	+	+	
Eurasian Wigeon	<i>Anas penelope</i>			+			+	
Northern Pintail	<i>Anas acuta</i>	+	+	+	+	+	+	
Northern Shoveler	<i>Anas clypeata</i>	+	+	+	+	+	+	
Redhead	<i>Aythya americana</i>		+	+	+	+	+	
Ring-necked Duck	<i>Aythya collaris</i>			+	+		+	
Lesser Scaup	<i>Aythya affinis</i>	+	+	+	+		+	
Greater Scaup	<i>Aythya marila</i>	+		+		+	+	
Canvasback	<i>Aythya valisineria</i>		+	+	+		+	
Ruddy Duck	<i>Oxyura jamaicensis</i>	+	+	+	+	+	+	
Bufflehead	<i>Bucephala albeola</i>	+	+	+	+	+	+	
Red-breasted Merganser	<i>Mergus serrator</i>	+	+	+	+	+	+	
Common Merganser	<i>Mergus merganser</i>	+	+	+	+		+	
Hooded Merganser	<i>Lophodytes cucullatus</i>			+	+			
Greater White-fronted Goose	<i>Anser albifrons</i>	+		+				
Snow Goose	<i>Chen caerulescens</i>	+		+				
Canada Goose	<i>Branta canadensis</i>	+		+	+		+	
Brant	<i>Branta bernicla</i>	+	+	+	+	+	+	
Common Goldeneye	<i>Bucephala clangula</i>	+		+			+	
Long-tailed duck	<i>Clangula hyemalis</i>			+	+			
Surf Scoter	<i>Melanitta perspicillata</i>	+	+	+	+	+	+	
Cathartidae (American Vultures)								
Turkey Vulture	<i>Cathartes aura</i>	+	+	+	+	+	+	
Accipitridae (Hawk, Old World Vultures, and Harriers)								
Osprey	<i>Pandion haliaetus</i>	+	+	+	+	+	+	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	+	+	+	+	+	+	
Red-shouldered Hawk	<i>Buteo lineatus</i>		+	+	+			
Rough-legged Hawk	<i>Buteo lagopus</i>			+				
Ferruginous Hawk	<i>Buteo regalis</i>	+		+				
Cooper's Hawk	<i>Accipiter cooperii</i>		+	+	+	+	+	
Sharp-shinned Hawk	<i>Accipiter striatus</i>			+	+	+	+	
Golden Eagle	<i>Aquila chrysaetos</i>			+				
White-tailed Kite	<i>Elanus leucurus</i>	+	+	+	+	+	+	
Northern Harrier	<i>Circus cyaneus</i>	+	+	+	+	+	+	
Falconidae (Caracaras and Falcons)								
American Kestrel	<i>Falco sparverius</i>	+	+	+	+	+	+	
Peregrine Falcon	<i>Falco peregrinus</i>	+	+	+			+	
Merlin	<i>Falco columbarius</i>	+		+	+		+	
Prairie Falcon	<i>Falco mexicanus</i>	+		+				

Appendix A6-7. Avian species observed within coastal wetlands of southern California (cont'd).

Species		Wetland						
Common name	Scientific Name	Anaheim Bay ¹	Agua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Penasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹	
Phasianidae (Pheasants and Quail)								
California Quail	<i>Callipepla californica</i>			+	+	+		
Ring-necked Pheasant	<i>Phasianus colchicus</i>			+				
Rallidae (Rails, Gallinules, and Coots)								
Virginia Rail	<i>Rallus limicola</i>			+	+			+
Clapper Rail	<i>Rallus longirostris</i>	+		+	+	+	+	+
Black Rail	<i>Laterallus jamaicensis</i>			+				
Sora	<i>Porzana carolina</i>		+	+	+	+	+	+
Common Moorhen	<i>Gallinula chloropus</i>			+			+	+
American Coot	<i>Fulica americana</i>	+	+	+	+	+	+	+
Purple Gallinule	<i>Porphyrrula martinica</i>				+			
Charadriidae (Plovers and Relatives)								
Black-bellied Plover	<i>Pluvialis squatarola</i>	+	+	+	+	+	+	+
Lesser Golden Plover	<i>Pluvialis dominica</i>	+	+	+				
Snowy Plover	<i>Charadrius alexandrinus</i>	+	+	+	+	+	+	+
Semipalmated Plover	<i>Charadrius semipalmatus</i>	+	+	+	+	+	+	+
Killdeer	<i>Charadrius vociferus</i>	+	+	+	+	+	+	+
Wilson's Plover	<i>Charadrius wilsonia</i>						+	
Recurvirostridae (Avocets and Stilts)								
Black-necked Stilt	<i>Himantopus mexicanus</i>	+	+	+	+	+	+	+
American Avocet	<i>Recurvirostra americana</i>	+	+	+	+	+	+	+
Scolopacidae (Sandpipers and Relatives)								
Spotted Sandpiper	<i>Actitis macularia</i>	+	+	+	+	+	+	+
Sanderling	<i>Calidris alba</i>	+	+	+	+	+	+	+
Western Sandpiper	<i>Calidris mauri</i>	+	+	+	+	+	+	+
Least Sandpiper	<i>Calidris minutilla</i>	+	+	+	+	+	+	+
Dunlin	<i>Calidris alpina</i>	+	+	+	+	+	+	+
Baird's Sandpiper	<i>Calidris bairdii</i>			+				
Red Knot	<i>Calidris canutus</i>	+	+	+	+	+	+	
Curlew Sandpiper	<i>Calidris ferruginea</i>			+				
Stilt Sandpiper	<i>Calidris himantopus</i>			+				
Pectoral Sandpiper	<i>Calidris melanotos</i>			+				
Sandpiper	<i>Calidris spp.</i>	+						
Surfbird	<i>Aphriza virgata</i>			+	+			
Ruddy Turnstone	<i>Arenaria interpres</i>	+		+	+			+
Black Turnstone	<i>Arenaria melanocephala</i>			+	+	+	+	+
Wandering Tattler	<i>Heteroscelus incanus</i>			+	+			
Red Phalarope	<i>Phalaropus fulicaria</i>			+				
Red-necked Phalarope	<i>Phalaropus lobatus</i>	+	+	+	+	+	+	+
Wilson's Phalarope	<i>Phalaropus tricolor</i>			+	+	+		
Solitary Sandpiper	<i>Tringa solitaria</i>			+				
Greater Yellowlegs	<i>Tringa melanoleuca</i>	+	+	+	+	+	+	+
Lesser Yellowlegs	<i>Tringa flavipes</i>		+	+	+	+	+	+

Appendix A6-7. Avian species observed within coastal wetlands of southern California (cont'd).

Species		Wetland					
Common name	Scientific Name	Anaheim Bay ¹	Aqua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Penasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹
Willet	<i>Catoptrophorus semipalmatus</i>	+	+	+	+	+	+
Whimbrel	<i>Numenius phaeopus</i>	+	+	+	+	+	+
Long-billed Curlew	<i>Numenius americanus</i>	+	+	+	+	+	+
Marbled Godwit	<i>Limosa fedoa</i>	+	+	+	+	+	+
Short-billed Dowitcher	<i>Limnodromus griseus</i>		+	+	+	+	+
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>		+	+	+		+
Dowitcher species	<i>Limnodromus spp.</i>	+	+	+	+	+	+
Common Snipe	<i>Gallinago gallinago</i>		+	+		+	+
Laridae (Terns & Gulls)							
Common Tern	<i>Sterna hirundo</i>	+	+	+	+	+	+
Forster's Tern	<i>Sterna forsteri</i>	+	+	+	+	+	+
Caspian Tern	<i>Sterna caspia</i>	+	+	+	+	+	+
Elegant Tern	<i>Sterna elegans</i>	+	+	+	+		+
Royal Tern	<i>Sterna maxima</i>	+	+	+	+	+	+
Least Tern	<i>Sterna antillarum browni</i>	+	+	+	+	+	+
Black Tern	<i>Chlidonias niger</i>			+			
Bonaparte's Gull	<i>Larus philadelphia</i>	+	+	+	+	+	+
Ring-billed Gull	<i>Larus delawarensis</i>	+	+	+	+	+	+
California Gull	<i>Larus californicus</i>	+	+	+	+		+
Herring Gull	<i>Larus argentatus</i>	+	+	+	+		+
Western Gull	<i>Larus occidentalis</i>	+	+	+	+	+	+
Mew Gull	<i>Larus canus</i>	+		+			+
Glaucous-winged Gull	<i>Larus glaucescens</i>	+		+			+
Heermann's Gull	<i>Larus heermanni</i>		+	+	+	+	+
Franklin's Gull	<i>Larus pipixcan</i>			+			
Thayer's Gull	<i>Larus thayeri</i>			+			+
Gull spp.	<i>Larus spp.</i>	+					
Black-legged Kittiwake	<i>Rissa tridactyla</i>			+			
Black Skimmer	<i>Rynchops niger</i>	+	+	+	+		+
Columbidae (Pigeons and Doves)							
Mourning Dove	<i>Zenaida macroura</i>	+	+	+	+	+	+
White-winged Dove	<i>Zenaida macroura</i>			+			
Band-tailed Pigeon	<i>Columba fasciata</i>			+			
Rock Dove	<i>Columba livia</i>	+	+	+	+	+	+
Spotted Dove	<i>Streptopelia chinensis</i>			+	+		
Cuculidae (Roadrunners)							
Greater Roadrunner	<i>Geococcyx californianus</i>				+	+	+
Strigidae and Tytonidae (Owls)							
Short-eared Owl	<i>Asio flammeus</i>			+			
Burrowing Owl	<i>Athene cunicularia</i>		+	+			
Great Horned Owl	<i>Bubo virginianus</i>			+	+	+	
Barn Owl	<i>Tyto alba</i>			+	+	+	
Caprimulgidae (Goatsuckers)							
Lesser Nighthawk	<i>Chordeiles acutipennis</i>			+			

Appendix A6-7. Avian species observed within coastal wetlands of southern California (cont'd).

Species		Wetland					
Common name	Scientific Name	Anaheim Bay ¹	Aqua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Penasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹
Apodidae (Swifts)							
White-throated Swift	<i>Aeronautes saxatalis</i>			+		+	+
Vaux's Swift	<i>Chaetura vauxi</i>	+		+	+	+	+
Trochilidae (Hummingbirds)							
Anna's Hummingbird	<i>Calypte anna</i>	+	+	+	+	+	+
Costa's Hummingbird	<i>Calypte costae</i>		+	+	+		+
Black-chinned Hummingbird	<i>Archilochus alexandri</i>		+	+	+		
Allen's/Rufous Hummingbird	<i>Selasphorus spp.</i>		+	+	+		
Allen's Hummingbird	<i>Selasphorus sasin</i>						+
Rufous Hummingbird	<i>Selasphorus rufus</i>						+
Alcedinidae (Kingfishers)							
Belted Kingfisher	<i>Ceryle alcyon</i>	+	+	+	+	+	+
Picidae (Woodpeckers)							
Downy Woodpecker	<i>Picoides pubescens</i>			+	+		+
Nuttall's Woodpecker	<i>Picoides nuttallii</i>			+	+		+
Hairy Woodpecker	<i>Picoides villosus</i>			+			
Northern Flicker	<i>Colaptes auratus</i>		+	+	+		+
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>			+			
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>			+			
Tyrannidae (Tyrant Flycatchers)							
Black Phoebe	<i>Sayornix nigricans</i>		+	+	+	+	+
Say's Phoebe	<i>Sayornis saya</i>	+	+	+	+		+
Western Kingbird	<i>Tyrannus verticalis</i>	+	+	+	+	+	+
Cassin's Kingbird	<i>Tyrannus vociferans</i>	+	+	+	+		+
Olive-sided Flycatcher	<i>Contopus borealis</i>			+			
Western Wood-pewee	<i>Contopus sordidulus</i>			+	+	+	+
Pacific Slope Flycatcher	<i>Empidonax difficilis</i>			+		+	+
Hammond's Flycatcher	<i>Empidonax hammondi</i>			+			
Willow Flycatcher	<i>Empidonax traillii</i>			+			
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>			+	+	+	+
Laniidae (Shrikes)							
Loggerhead Shrike	<i>Lanius ludovicianus</i>	+	+	+	+	+	+
Vireonidae (Viers)							
Warbling Vireo	<i>Vireo gilvus</i>			+	+		+
Hutton's Vireo	<i>Vireo huttoni</i>			+			
Corvidae (Jays, Magpies, and Crows)							
American Crow	<i>Corvus brachyrhynchos</i>	+	+	+	+	+	+
Common Raven	<i>Corvus corax</i>	+	+	+	+	+	+
Scrub Jay	<i>Aphelocoma californica</i>			+	+	+	+
Alaudidae (Larks)							
Horned Lark	<i>Eremophila alpestris</i>	+		+	+		+
Hirundinidae (Swallows)							
Violet-green Swallow	<i>Tachycineta thalassina</i>			+	+		+
Tree Swallow	<i>Tachycineta thalassina</i>	+		+	+		+
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	+	+	+	+		+
Barn Swallow	<i>Hirundo rustica</i>	+	+	+	+		+

Appendix A6-7. Avian species observed within coastal wetlands of southern California (cont'd).

Species		Wetland						
Common name	Scientific Name	Anaheim Bay ¹	Agua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Peñasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	+	+	+	+		+	
Swallow spp.	<i>Hirundo spp.</i>							
Bank Swallow	<i>Riparia riparia</i>	+		+				
Purple Martin	<i>Progne subis</i>			+			+	
Aegithalidae (Bushtit)								
Bushtit	<i>Psaltriparus minimus</i>				+	+	+	+
Troglodytidae (Wrens)								
Bewick's Wren	<i>Thryomanes bewickii</i>		+	+	+		+	
Marsh Wren	<i>Cistothorus palustris</i>	+	+	+			+	
Rock Wren	<i>Salpinctes obsoletus</i>			+				
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>							
House Wren	<i>Troglodytes aedon</i>				+	+	+	
Muscicapidae (Gnatcatchers, Kinglets, Thrushes, Wrentit)								
California Gnatcatcher	<i>Polioptila californica californica</i>			+	+		+	
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>			+			+	
Ruby-crowned Kinglet	<i>Regulus calendula</i>			+			+	
Hermit Thrush	<i>Catharus guttatus</i>			+			+	
Wrentit	<i>Chamaea fasciata</i>		+	+			+	
American Robin	<i>Turdus migratorius</i>							
Swainson's Thrush	<i>Cathartes ustulatus</i>			+			+	
Western Bluebird	<i>Sialia mexicana</i>			+				
Mimidae (Mockingbirds and Thrashers)								
Northern Mockingbird	<i>Mimus polyglottos</i>	+	+	+	+	+	+	
California Thrasher	<i>Toxostoma redivivum</i>		+	+		+	+	
Sturnidae (Starlings)								
European Starling	<i>Sturnus vulgaris</i>	+	+	+	+	+	+	
Motacillidae (Pipits and Wagtails)								
American Pipit	<i>Anthus rubescens</i>	+	+	+	+		+	
Bombycillidae (Waxwings)								
Cedar Waxwing	<i>Bombycilla cedrorum</i>							
Ptilogonatidae (Silky-flycatchers)								
Phainopepla	<i>Phainopepla nitens</i>				+			
Emberizidae (Warblers, Sparrows, Blackbirds and Relatives)								
Yellow-rumped Warbler	<i>Dendroica coronata</i>	+	+	+	+		+	
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>			+				
Hermit Warbler	<i>Dendroica occidentalis</i>			+				
Yellow Warbler	<i>Dendroica petechia</i>		+	+				
Towensend's Warbler	<i>Dendroica townsendi</i>			+				
Wilson's Warbler	<i>Wilsonia pusilla</i>	+		+	+		+	
Orange-crowned Warbler	<i>Vermivora celata</i>	+	+	+	+		+	
Nashville Warbler	<i>Vermivora ruficappilla</i>		+	+				
MacGillivary's Warbler	<i>Oporornis tolmieii</i>			+				
House Sparrow	<i>Passer domesticus</i>		+	+	+	+	+	
Lark Sparrow	<i>Chondestes grammacus</i>							
Savannah Sparrow	<i>Passerculus sandwichensis</i>	+	+	+	+	+		

Appendix A6-7. Avian species observed within coastal wetlands of southern California (cont'd).

Species		Wetland					
Common name	Scientific Name	Anaheim Bay ¹	Aqua Hedionda Lagoon ^{2,3}	San Elijo Lagoon ^{4,5}	San Dieguito Lagoon ^{6,7}	Los Penasquitos Lagoon ⁸	Batiquitos Lagoon-Post Restoration ⁹
Belding's Savannah Sparrow	<i>Passerculus sandwichensis beldingi</i>	+	+	+	+		+
Northern Savannah Sparrow	<i>Passerculus sandwichensis nevadensis</i>		+	+	+		
Fox Sparrow	<i>Passerella iliaca</i>			+		+	
Lazuli Bunting	<i>Passerina amoena</i>			+	+		
Song Sparrow	<i>Melospiza melodia</i>			+	+	+	+
Lincoln's Sparrow	<i>Melospiza lincolni</i>	+	+	+	+		+
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	+	+	+	+	+	+
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>			+	+	+	
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>			+			
Grasshopper Sparrow	<i>Ammodramus savannarum</i>			+			
Brewer's Sparrow	<i>Spizella breweri</i>	+	+		+		
Chipping Sparrow	<i>Spizella passerina</i>						+
Spotted Towhee	<i>Pipilo erythrrophthalmus</i>			+		+	+
California Towhee	<i>Pipilo crissalis</i>		+	+	+	+	+
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	+	+	+	+	+	+
Tricolored Blackbird	<i>Agelaius tricolor</i>			+	+	+	+
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>						
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>			+	+	+	+
Brown-headed Cowbird	<i>Molothrus ater</i>	+		+	+		+
Blue Grosbeak	<i>Guiraca caerulea</i>			+	+	+	+
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>			+	+	+	+
Bullock's Oriole	<i>Icterus bullockii</i>			+	+	+	+
Hooded Oriole	<i>Icterus cucullatus</i>			+	+	+	+
Western Tanager	<i>Piranga ludoviciana</i>			+			+
Common Yellowthroat	<i>Geothlypis trichas</i>	+	+	+	+	+	+
Yellow-breasted Chat	<i>Icteria virens</i>						+
Western Meadowlark	<i>Sturnella neglecta</i>	+	+	+	+	+	+
Fringillidae (Finches)							
House Finch	<i>Carpodacus mexicanus</i>	+	+	+	+	+	+
Purple Finch	<i>Carpodacus purpureus</i>						+
Lesser Goldfinch	<i>Carduelis psaltria</i>	+	+	+	+	+	+
Lawrence's Goldfinch	<i>Carduelis lawrencei</i>			+			+
American Goldfinch	<i>Carduelis tristis</i>	+		+	+	+	+
Total number of species per wetland		120	122	234	164	123	168

¹MEC 1993c; ²CDFG 1976; ³MEC 1995; ⁴King et al. 1987; ⁵MEC 1993b; ⁶Audubon Society 1990; ⁷MEC 1993a; ⁸CDFG 1974;

⁹Merkel & Associates 1998, 1999, 2000, 2002

Chapter 8

Benthic Invertebrate Community Appendices



**Appendix A8-1. Epibenthic organisms captured during fish surveys,
grouped by station (1999-2006)**

Appendix A8-1. Epibenthic organisms captured during fish surveys, grouped by station (1999-2006).

Station 1

Group	Species	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01 day&night	Oct-01	Jan-06	Apr-06	Jul-06 day	Jul-06 night	Oct-06
<u>Gastropods</u>												
	<i>Alia carinata</i>											
	<i>Bulla gouldiana</i>	10	2	1			1	1		128	230	
	<i>Cerithidea californica</i>							23	27	1	2	2
	<i>Tagelus californianus</i>		1									
	<i>Nassarius tegula</i>	14					5					1
	<i>Navanax inermis</i>	3			1		23	1		1		3
<u>Bivalves</u>												
	<i>Argopecten ventricosus</i>	7	1		2		1					1
	<i>Ostrea lurida</i>						1					
	<i>Chione</i> sp.						1					
	<i>Chione californiensis</i>						1					
	<i>Chione undatella</i>						1		1	1		
	<i>Laevicardium substriatum</i>						1					
	<i>Tagelus californianus</i>						1		1			
	<i>Mytilus galloprovincialis</i>						2					1
	<i>Cancer productus</i>											
<u>Crustaceans</u>												
	<i>Portunus xantusii xantusii</i>						1					
	<i>Calinectes arcuatus</i>	1										
	<i>Hemigrapsus oregonensis</i>						6					
	<i>Lysmata californica</i>						3	8				
	<i>Hippolyte californiensis</i>						2				8	
	<i>Palaemon macrodactylus</i>	6			1						5	1
	<i>Pachygrapsus crassipes</i>	1				3			1			
Total Number of Invertebrate Species at Station 1		7	3	1	3	3	12	4	4	7	3	7

Station 2

Group	Species	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01 day&night	Oct-01	Jan-06	Apr-06	Jul-06 day	Jul-06 night	Oct-06
<u>Cephalopods</u>						1						
	<i>Octopus bimaculatus</i>											
<u>Gastropods</u>												
	<i>Aplysia californica</i>											
	<i>Alia carinata</i>											
	<i>Bulla gouldiana</i>	785	109	13	22	3	12				3	
	<i>Cerithidea californica</i>							1	17	18	6	1
	<i>Navanax inermis</i>			11	16	3	7	3		1	5	
	<i>Nassarius tegula</i>	6	1	24	26		1			9	81	6
<u>Bivalves</u>												
	<i>Chione fluctifraga</i>						2					
	<i>Chione undatella</i>			1								
	<i>Chione californiensis</i>			1	3							
	<i>Argopecten ventricosus</i>				1	3	7	1	2			
	<i>Musculista senhousiae*</i>				2			1		1		
	<i>Laevicardium substriatum</i>				4	1		1				2
	<i>Macoma nasuta</i>							1				
	<i>Mytilus galloprovincialis</i>									1		
	<i>Mytilus californianus</i>		2									
<u>Crustaceans</u>												
	<i>Cancer antennarius</i>					1						
	<i>Portunus xantusii xantusii</i>							2				
	<i>Hemigrapsus nudus</i>							1				
	<i>Hemigrapsus oregonensis</i>							1		1		
	<i>Hippolyte californiensis</i>							1			1	
	<i>Pachygrapsus crassipes</i>	1										
<u>Lophophorata</u>										present		
	<i>Zoobotryon verticillatum</i>											
Total Number of Invertebrate Species at Station 2		5	2	5	8	6	11	5	2	8	4	3

Station 3

Group	Species	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01 day&night	Oct-01	Jan-06	Apr-06	Jul-06 day	Jul-06 night	Oct-06
<u>Anthozoa</u>	<i>Epiactis prolifera</i>							1				
<u>Cephalopods</u>	<i>Octopus bimaculatus</i>			1								
<u>Gastropods</u>	<i>Alia carinata</i>									42	10	1
	<i>Bulla gouldiana</i>	1432	460		10	38	36	1	1	7	4	6
	<i>Conus californicus</i>								1			
	<i>Cerithidea californica</i>	1								2		
	<i>Crucibulum spinosum</i>								1	1		
	<i>Nassarius tegula</i>	28		1	2	3		1	1	42	19	2
	<i>Navanax inermis</i>	1		73	37	1		6		3	33	6
<u>Bivalves</u>	<i>Musculista senhousei*</i>									1		
	<i>Mytilus californianus</i>			1	2							
	<i>Mytilus galloprovincialis</i>		37								4	
	<i>Argopecten ventricosus</i>	26	9	2	10	3	1086	3	1	4	1	
	<i>Chione undatella</i>					3						
	<i>Laevicardium substriatum</i>				1			1			2	
<u>Crustaceans</u>	<i>Hippolyte californiensis</i>			2	100	47	108				43	89
	<i>Portunus xantusii xantusii</i>			4								
	<i>Cancer jordani</i>			1								
	<i>Hemigrapsus oregonensis</i>				2							
	<i>Cycloanthops novemdentatus</i>									66		
	<i>Palaemon macrodactylus</i>	10										1
	<i>Pachygrapsus crassipes</i>											
	<i>Pugettia producta</i>			1								
	<i>Epialtoides hiltoni</i>			1								
Total Number of Invertebrate Species at Station 3		7	3	10	8	6	3	7	5	8	8	6

Station 4

Group	Species	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01 day&night	Oct-01	Jan-06	Apr-06	Jul-06 day	Jul-06 night	Oct-06
<u>Anthozoa</u>	<i>Metridium</i> sp.							1				
<u>Cephalopods</u>	<i>Octopus bimaculatus</i>			1								
<u>Gastropods</u>	<i>Aplysia californica</i>	3	1	2	6	6	117	308		38		21
	<i>Alia carinata</i>											
	<i>Bulla gouldiana</i>	590	149		350	124	83	325	565	5	96	20
	<i>Cerithidea californica</i>	13						3			3	
	<i>Crepidula fornicata</i>											
	<i>Fusinus luteopictus</i>					3						
	<i>Lithopoma undosa</i>											
	<i>Littorina planaxi</i>	13				13						
	<i>Conus californicus</i>			2	17	2	5		1	5	5	
	<i>Nassarius</i> sp.						1					
	<i>Nassarius fossatus</i>						1					1
	<i>Kelletia kelletii</i>							1				
	<i>Nassarius tegula</i>					7	13	1	42	6	19	
	<i>Navanax inermis</i>		7	133	34	2	1	1	1			
	<i>Notoacmea</i> sp.						1					
	<i>Notoacmea depicta</i>						3					
	<i>Pusula pediculus</i>							1				
	<i>Tegula aureotincta</i>						1	1				
<u>Bivalves</u>	<i>Argopecten ventricosus</i>	55	66	150	211	49	110	1	2	3	8	26
	<i>Laevicardium substriatum</i>				7		16	2		1	1	1
	<i>Mytilus galloprovincialis</i>	1									2	
	<i>Musculista senhousei*</i>				6			1				
	<i>Mytilus californianus</i>				1							
	<i>Cirolana harfordi</i>							14				
	<i>Pagurus hirsutiusculus</i>						2					

Station 4 continued

Group	Species	Jul-99	Oct-99	Jan-01	Apr-01	day&night	Oct-01	Jan-06	Apr-06	day	night	Oct-06
	<i>Chione californiensis</i>				5			9				
	<i>Chione undatella</i>						1					1
	<i>Tapes japonica*</i>											
	<i>Tagelus subteres</i>											
<u>Crustaceans</u>	<i>Cancer antennarius</i>			1	1	11						
	<i>Cancer jordani</i>			2	1							
	<i>Crangon franciscorum</i>				555	756	839	420	2			
	<i>Hippolyte californiensis</i>					1						
	<i>Isocheles pilosus</i>								40			
	<i>Palaemon macrodactylus</i>			1	5	1	3					
	<i>Hemigrapsus oregonensis</i>					1	1					
	<i>Lophopanopeus frontalis</i>											
	<i>Loxorhynchus grandis</i>			1								
	<i>Portunus xantusii xantusii</i>						1					
	<i>Pachygrapsus crassipes</i>				1	7						
	<i>Paguristes ulreyi</i>											
	<i>Pugettia</i> sp.			11								
<u>Echinoids</u>	<i>Lytechinus anamesus</i>		1	1		17	1					
	<i>Strongylocentrotus purpuratus</i>			3	4	3						
	<i>Strongylocentrotus franciscanus</i>					1						
<u>Asteroids</u>	<i>Dendraster excentricus</i>	5	1									
	<i>Astropecten armatus</i>			1								
<u>Turbellarian</u>	<i>Notoplana acticola</i>						2					
Total Number of Invertebrate Species at Station 4		7	7	14	16	17	23	14	6	9	6	8

Station 5

Group	Species	Jul-99	Oct-99	Jan-01	Apr-01	Jul-01 day&night	Oct-01	Jan-06	Apr-06	Jul-06 day	Jul-06 night	Oct-06
<u>Gastropods</u>	<i>Aplysia californica</i>				1		1					
	<i>Alia carinata</i>						11					1
	<i>Bulla gouldiana</i>	512	184		6	19	159	268	25	3	4,124	3
	<i>Conus californicus</i>			4			2					11
	<i>Navanax inermis</i>					1						1
	<i>Nassarius tegula</i>	12			10	3	6	4	4	85	152	
	<i>Teluga aureotincta</i>									2		
	<i>Polinices</i> sp.						1					
	<i>Cerithidea californica</i>						1		11			
<u>Crustaceans</u>	<i>Crangon franciscorum</i>							2				
	<i>Pagurus</i> sp.						2					
	<i>Pugettia producta</i>											
	<i>Pugettia</i> sp.			2								7
	<i>Calinectes arcuatus</i>											
	<i>Pagurus hirsutiusculus</i>			1			1					
	<i>Palaemon macrodactylus</i>							6				
	<i>Isocheles pilosus</i>					1						
	<i>Lophopanopeus frontalis</i>						2					
	<i>Pachygrapsus crassipes</i>	1			1		1					1
	<i>Hemigrapsus oregonensis</i>	1				1	3					
	<i>Hippolyte californiensis</i>						3					
<u>Bivalves</u>	<i>Argopecten ventricosus</i>	57	34	6	169	22	33	30	1	10	17	
	<i>Laevicardium substriatum</i>		7						2		2	
	<i>Musculista senhousei*</i>	1	1	1					1			
	<i>Ostrea lurida</i>					1						
<u>Echinoids</u>	<i>Dendraster excentricus</i>					1						
	<i>Lytechinus anamesus</i>			1		3						
Total Number of Invertebrate Species at Station 5		6	5	5	5	9	10	10	5	7	6	6

*Non-native species

Appendix A8-2. Grain size analysis from benthic monitoring stations (1997-2006)

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (January 1997).

Station	Elevation	SAND							SILT	
		Coarse	Medium			Fine			CLAY	
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200 Pan	
Weight retained (% of total sample)										
1	-2 ft. MLLW	1.2%	2.5%	8.2%	8.2%	10.4%	10.4%	7.4%	0.0%	51.7%
	1 ft. MLLW	0.8%	0.1%	2.9%	3.6%	17.0%	40.5%	31.4%	0.0%	3.9%
	3 ft. MLLW	0.2%	0.4%	0.3%	0.8%	2.0%	3.1%	8.7%	0.0%	84.4%
2	-2 ft. MLLW	3.2%	4.6%	2.7%	5.3%	5.2%	5.1%	6.7%	0.0%	66.9%
	1 ft. MLLW	3.5%	8.2%	9.1%	9.9%	16.5%	9.8%	18.3%	0.0%	24.5%
	3 ft. MLLW	0.7%	2.1%	3.7%	4.7%	10.8%	6.9%	7.7%	0.0%	63.4%
3	-2 ft. MLLW	0.7%	1.3%	2.1%	3.8%	27.1%	40.4%	19.8%	0.0%	4.9%
	1 ft. MLLW	0.2%	0.8%	1.2%	1.4%	10.0%	39.3%	43.1%	0.0%	4.0%
	3 ft. MLLW	2.0%	1.3%	1.7%	2.0%	19.9%	32.0%	33.1%	0.0%	8.0%
4	-2 ft. MLLW	1.0%	1.0%	1.3%	3.4%	34.9%	40.8%	15.7%	0.0%	1.7%
	1 ft. MLLW	2.0%	2.0%	3.1%	6.0%	26.2%	40.3%	16.1%	0.0%	4.4%
	3 ft. MLLW	0.7%	0.4%	0.8%	2.2%	24.3%	40.2%	29.4%	0.0%	2.0%
5	-2 ft. MLLW	0.6%	0.2%	0.7%	2.4%	12.7%	26.1%	47.3%	0.0%	9.6%
	1 ft. MLLW	0.1%	0.7%	1.9%	5.9%	39.1%	37.1%	13.3%	0.0%	1.9%
	3 ft. MLLW	0.2%	0.2%	1.2%	3.1%	48.4%	41.8%	4.3%	0.0%	0.7%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (April 1997).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	5.3%	13.6%	3.6%	6.2%	6.3%	8.7%	11.0%	0.0%	45.3%
	+1 ft. MLLW	11.9%	5.0%	6.6%	2.5%	3.3%	4.8%	12.9%	0.0%	53.0%
	+3 ft. MLLW	0.8%	0.4%	1.1%	3.0%	19.8%	45.4%	27.7%	0.0%	1.8%
2	-2 ft. MLLW	7.2%	5.6%	6.3%	6.2%	13.1%	15.9%	21.9%	0.0%	23.8%
	+1 ft. MLLW	7.4%	6.2%	7.1%	13.6%	12.0%	5.1%	18.3%	0.0%	38.6%
	+3 ft. MLLW	3.6%	3.5%	3.8%	5.6%	12.6%	17.7%	31.8%	0.0%	21.4%
3	-2 ft. MLLW	2.0%	0.6%	1.9%	3.0%	13.0%	32.4%	38.9%	0.0%	8.2%
	+1 ft. MLLW	2.2%	1.1%	2.3%	3.8%	10.5%	34.3%	37.1%	0.0%	8.7%
	+3 ft. MLLW	0.0%	0.0%	0.1%	1.2%	16.5%	44.4%	33.9%	0.0%	3.8%
4	-2 ft. MLLW	3.1%	4.3%	4.1%	4.9%	9.6%	16.6%	19.3%	0.0%	38.1%
	+1 ft. MLLW	10.7%	1.5%	2.0%	3.1%	19.4%	34.0%	22.1%	0.0%	7.2%
	+3 ft. MLLW	1.2%	0.7%	0.7%	2.3%	11.4%	25.1%	51.3%	0.0%	7.3%
5	-2 ft. MLLW	1.5%	1.7%	2.1%	4.0%	14.9%	28.6%	42.0%	0.0%	5.2%
	+1 ft. MLLW	0.6%	1.0%	1.9%	2.0%	13.9%	44.2%	33.2%	0.0%	3.2%
	+3 ft. MLLW	2.2%	1.9%	2.0%	6.3%	32.3%	36.5%	13.7%	0.0%	5.1%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (October 1997).

Station	Elevation	SAND							SILT CLAY	
		Coarse	Medium		Fine					
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1	-2 ft. MLLW	0.0%	0.1%	0.1%	0.6%	3.8%	6.8%	9.5%	4.9%	74.2%
	+1 ft. MLLW	0.0%	1.7%	0.7%	2.1%	10.3%	27.5%	33.9%	9.6%	14.3%
	+3 ft. MLLW	2.6%	0.9%	0.6%	2.3%	28.8%	42.3%	15.8%	3.3%	3.3%
2	-2 ft. MLLW	0.0%	0.0%	0.7%	1.3%	2.1%	2.3%	7.1%	3.2%	83.3%
	+1 ft. MLLW	0.0%	0.0%	1.1%	4.4%	18.3%	19.4%	21.9%	7.3%	27.6%
	+3 ft. MLLW	0.0%	1.6%	2.3%	9.7%	37.6%	23.0%	12.5%	4.3%	9.2%
3	-2 ft. MLLW	0.76%	0.42%	0.61%	2.64%	17.38%	38.14%	29.49%	5.58%	4.97%
	+1 ft. MLLW	0.1%	0.0%	0.1%	1.0%	13.4%	47.1%	33.7%	4.0%	0.6%
	+3 ft. MLLW	0.4%	0.0%	0.5%	2.2%	24.5%	46.0%	23.4%	2.6%	0.3%
4	-2 ft. MLLW	0.0%	0.0%	0.0%	0.2%	14.3%	46.2%	31.8%	4.0%	3.4%
	+1 ft. MLLW	1.1%	5.1%	1.8%	5.0%	30.7%	35.2%	17.1%	2.4%	1.5%
	+3 ft. MLLW	2.1%	2.7%	1.3%	3.3%	32.2%	35.9%	15.3%	2.4%	4.9%
5	-2 ft. MLLW	0.0%	0.2%	0.3%	1.8%	22.4%	39.1%	24.9%	8.2%	3.2%
	+1 ft. MLLW	0.0%	0.0%	0.1%	1.1%	42.0%	42.1%	12.3%	2.5%	0.0%
	+3 ft. MLLW	0.0%	0.5%	1.4%	2.2%	17.9%	34.5%	19.0%	5.8%	18.7%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (January 1998).

Station	Elevation	SAND							SILT CLAY	
		Coarse	Medium		Fine					
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1	-2 ft. MLLW	0.00%	0.00%	7.64%	0.76%	4.39%	4.68%	7.16%	2.87%	72.49%
	+1 ft. MLLW	0.00%	2.24%	0.94%	1.84%	11.03%	34.36%	37.85%	8.00%	3.73%
	+3 ft. MLLW	0.00%	1.54%	0.87%	2.36%	14.95%	27.89%	31.16%	16.31%	4.92%
2	-2 ft. MLLW	0.00%	0.13%	0.13%	0.58%	1.54%	1.73%	23.50%	2.75%	69.65%
	+1 ft. MLLW	0.00%	1.01%	0.35%	2.35%	10.15%	10.36%	19.84%	5.92%	49.56%
	+3 ft. MLLW	0.00%	2.72%	6.87%	4.53%	27.85%	27.16%	25.45%	3.57%	1.85%
3	-2 ft. MLLW	0.00%	0.08%	0.08%	0.78%	11.19%	39.25%	41.63%	5.67%	1.30%
	+1 ft. MLLW	0.00%	0.04%	0.14%	0.54%	9.38%	46.45%	10.72%	32.20%	0.54%
	+3 ft. MLLW	0.00%	0.30%	0.31%	1.41%	14.35%	38.86%	39.31%	4.42%	1.04%
4	-2 ft. MLLW	0.00%	0.08%	0.03%	0.05%	9.64%	45.59%	38.19%	4.05%	2.38%
	+1 ft. MLLW	0.00%	0.08%	0.11%	0.03%	3.62%	39.99%	46.58%	4.84%	4.76%
	+3 ft. MLLW	0.00%	0.27%	0.54%	0.75%	4.51%	39.65%	39.54%	4.67%	10.09%
5	-2 ft. MLLW	0.00%	0.09%	0.11%	0.66%	17.35%	37.94%	33.87%	8.11%	1.85%
	+1 ft. MLLW	0.00%	0.05%	0.16%	1.08%	20.45%	35.89%	27.97%	6.44%	7.96%
	+3 ft. MLLW	0.00%	0.15%	0.12%	1.82%	18.12%	34.81%	27.71%	5.64%	11.62%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (April 1998).

Station	Elevation	SAND							SILT CLAY	
		Coarse	Medium		Fine					
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1	-2 ft. MLLW	0.00%	1.61%	0.04%	0.78%	2.00%	3.13%	5.91%	0.65%	85.88%
	+1 ft. MLLW	0.00%	1.04%	1.12%	3.80%	20.44%	34.44%	29.77%	6.54%	2.84%
	+3 ft. MLLW	0.00%	1.80%	1.26%	3.61%	20.32%	40.10%	27.06%	4.60%	1.26%
2	-2 ft. MLLW	0.00%	0.43%	0.91%	1.97%	8.75%	13.76%	9.42%	2.68%	62.07%
	+1 ft. MLLW	0.00%	2.32%	2.11%	3.78%	9.81%	15.74%	31.96%	9.85%	24.43%
	+3 ft. MLLW	0.00%	1.06%	0.29%	2.65%	19.72%	28.66%	35.27%	5.06%	7.29%
3	-2 ft. MLLW	0.00%	0.10%	0.10%	0.20%	6.90%	14.60%	10.65%	10.75%	56.69%
	+1 ft. MLLW	0.00%	0.19%	0.54%	3.17%	22.27%	46.02%	25.49%	2.17%	0.15%
	+3 ft. MLLW	0.00%	0.28%	0.32%	1.04%	9.98%	45.57%	39.43%	3.21%	0.18%
4	-2 ft. MLLW	0.00%	0.25%	0.49%	0.29%	6.76%	48.41%	35.41%	3.88%	4.50%
	+1 ft. MLLW	0.00%	0.99%	0.24%	0.55%	1.49%	44.33%	39.46%	3.94%	9.01%
N/A	+3 ft. MLLW	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	-2 ft. MLLW	0.00%	0.00%	0.18%	0.59%	8.18%	41.28%	39.39%	9.79%	0.59%
	+1 ft. MLLW	0.00%	0.00%	0.28%	2.00%	33.52%	47.73%	14.70%	1.39%	0.37%
	+3 ft. MLLW	0.00%	0.16%	0.79%	4.47%	33.07%	39.12%	19.30%	2.09%	1.00%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (July 1998).

Station	Elevation	SAND							SILT CLAY	
		Coarse	Medium		Fine					
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1	-2 ft. MLLW	0.00%	10.32%	0.51%	2.37%	17.14%	34.13%	29.39%	6.14%	20.10%
	+1 ft. MLLW	0.00%	16.41%	1.34%	3.63%	12.53%	31.17%	29.06%	5.85%	5.40%
	+3 ft. MLLW	0.00%	12.92%	0.39%	1.28%	12.99%	37.24%	28.85%	4.89%	1.45%
2	-2 ft. MLLW	0.00%	80.50%	0.31%	1.08%	3.87%	5.42%	5.73%	3.10%	65.58%
	+1 ft. MLLW	0.00%	0.00%	1.05%	2.17%	4.34%	7.56%	26.42%	10.25%	48.20%
	+3 ft. MLLW	0.00%	14.74%	0.97%	2.48%	14.58%	18.51%	32.77%	5.74%	10.21%
3	-2 ft. MLLW	0.00%	14.81%	0.14%	1.15%	17.97%	32.33%	29.82%	2.96%	0.82%
	+1 ft. MLLW	0.00%	0.18%	0.72%	1.62%	25.99%	43.64%	25.12%	2.13%	0.60%
	+3 ft. MLLW	0.00%	12.99%	0.25%	1.16%	17.19%	43.21%	22.06%	2.65%	0.49%
4	-2 ft. MLLW	0.00%	0.00%	0.15%	0.24%	11.70%	37.97%	45.17%	4.38%	0.39%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.00%	17.19%	47.56%	30.40%	2.20%	2.64%
	+3 ft. MLLW	0.00%	5.56%	28.35%	24.51%	2.78%	6.82%	24.51%	2.78%	6.82%
5	-2 ft. MLLW	0.00%	14.07%	0.16%	1.10%	21.23%	46.56%	16.12%	0.50%	0.26%
	+1 ft. MLLW	0.00%	12.84%	0.05%	0.42%	15.35%	36.97%	27.11%	3.96%	3.30%
	+3 ft. MLLW	0.00%	11.06%	0.19%	1.15%	15.68%	37.80%	28.41%	4.53%	1.17%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (October 1998).

Station	Elevation	SAND							SILT CLAY	
		Coarse	Medium		Fine					
		U.S. Standard Sieve Size								
		16	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1	-2 ft. MLLW	0.00%	0.50%	0.25%	0.38%	1.63%	6.45%	19.15%	11.08%	60.58%
	+1 ft. MLLW	0.00%	0.21%	0.16%	0.58%	5.62%	24.30%	38.62%	13.21%	17.29%
	+3 ft. MLLW	0.00%	0.39%	0.54%	1.59%	13.25%	35.17%	38.17%	9.44%	1.45%
2	-2 ft. MLLW	0.00%	1.19%	1.08%	1.63%	2.60%	5.31%	10.83%	10.62%	66.74%
	+1 ft. MLLW	0.00%	0.50%	0.35%	0.67%	3.60%	8.97%	8.97%	13.08%	63.79%
	+3 ft. MLLW	0.00%	0.29%	0.64%	4.63%	28.31%	27.70%	24.60%	5.43%	8.40%
3	-2 ft. MLLW	0.00%	0.42%	0.60%	1.69%	18.26%	35.06%	32.32%	4.59%	7.06%
	+1 ft. MLLW	0.00%	0.19%	0.45%	2.02%	26.80%	40.96%	21.76%	1.97%	5.86%
	+3 ft. MLLW	0.00%	0.08%	0.22%	1.03%	14.00%	52.67%	28.76%	1.99%	1.25%
4	-2 ft. MLLW	0.00%	0.00%	0.49%	0.41%	4.20%	19.87%	27.37%	5.65%	42.00%
	+1 ft. MLLW	0.00%	0.36%	0.30%	0.30%	7.67%	43.04%	40.77%	3.93%	3.62%
	+3 ft. MLLW	0.00%	0.12%	0.08%	0.15%	8.66%	40.28%	31.50%	3.67%	15.54%
5	-2 ft. MLLW	0.00%	0.06%	0.19%	0.57%	13.61%	50.39%	25.93%	3.82%	5.43%
	+1 ft. MLLW	0.00%	0.45%	0.79%	2.71%	33.37%	40.07%	17.91%	2.97%	1.73%
	+3 ft. MLLW	0.00%	0.17%	0.14%	0.46%	8.48%	30.67%	26.75%	4.99%	28.34%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (January 1999).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	1.42%	0.08%	0.16%	0.24%	0.71%	1.27%	2.53%	3.80%	89.79%
	+1 ft. MLLW	0.74%	0.25%	0.69%	3.01%	11.46%	33.93%	21.78%	16.25%	11.90%
	+3 ft. MLLW	0.00%	0.09%	0.17%	0.91%	6.94%	38.32%	42.05%	8.72%	2.79%
2	-2 ft. MLLW	0.00%	0.07%	0.07%	0.27%	2.80%	4.00%	9.86%	7.00%	75.95%
	+1 ft. MLLW	0.00%	1.09%	0.35%	1.69%	5.44%	7.43%	21.88%	10.31%	51.36%
	+3 ft. MLLW	0.00%	0.00%	0.00%	2.48%	3.56%	2.70%	3.88%	3.78%	83.60%
3	-2 ft. MLLW	2.12%	0.06%	0.22%	0.89%	10.89%	37.19%	40.48%	5.64%	2.51%
	+1 ft. MLLW	0.00%	0.18%	0.24%	1.26%	18.79%	45.34%	29.98%	2.77%	1.44%
	+3 ft. MLLW	0.00%	0.70%	0.58%	1.50%	8.66%	34.69%	43.98%	7.39%	2.51%
4	-2 ft. MLLW	0.00%	0.00%	0.00%	0.00%	3.88%	23.40%	38.35%	9.71%	24.66%
	+1 ft. MLLW	0.19%	0.13%	0.09%	0.17%	4.97%	38.41%	45.54%	4.88%	5.63%
	+3 ft. MLLW	0.29%	1.63%	1.44%	2.49%	9.39%	15.13%	24.43%	9.77%	35.44%
5	-2 ft. MLLW	0.00%	0.37%	0.17%	0.50%	8.14%	23.38%	38.04%	12.46%	16.94%
	+1 ft. MLLW	0.00%	0.24%	0.33%	0.63%	16.76%	38.32%	34.97%	8.25%	0.50%
	+3 ft. MLLW	0.00%	0.04%	0.16%	1.02%	20.43%	44.55%	27.86%	5.18%	0.76%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (April 1999).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	0.00%	0.00%	0.00%	1.65%	0.24%	0.71%	3.07%	5.66%	88.68%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.00%	2.93%	10.55%	35.74%	10.55%	40.23%
	+3 ft. MLLW	0.00%	0.00%	0.00%	2.75%	19.98%	30.46%	36.08%	9.86%	0.87%
2	-2 ft. MLLW	1.67%	0.00%	0.00%	0.00%	1.67%	0.48%	28.71%	10.05%	57.42%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	53.19%	0.93%	45.88%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.00%	0.00%	4.08%	6.94%	1.22%	87.76%
3	-2 ft. MLLW	0.00%	0.00%	0.00%	0.94%	20.56%	23.66%	36.56%	4.84%	13.44%
	+1 ft. MLLW	0.00%	0.00%	0.05%	0.88%	42.12%	38.24%	18.05%	0.66%	0.00%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.14%	63.83%	22.09%	13.36%	0.58%	0.00%
4	-2 ft. MLLW	0.00%	0.00%	0.00%	0.00%	20.45%	24.90%	22.84%	3.16%	28.65%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.00%	13.73%	28.83%	28.15%	2.12%	27.16%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.24%	0.00%	99.76%
5	-2 ft. MLLW	0.00%	0.00%	0.00%	0.43%	64.56%	29.62%	5.39%	0.00%	0.00%
	+1 ft. MLLW	0.00%	0.00%	0.64%	12.73%	55.40%	19.26%	9.75%	1.46%	0.76%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.00%	17.40%	8.46%	13.48%	3.80%	56.86%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (July 1999).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	0.00%	0.00%	0.00%	0.68%	0.95%	12.42%	3.60%	1.97%	80.39%
	+1 ft. MLLW	0.00%	0.00%	0.05%	0.44%	11.79%	22.86%	31.43%	6.65%	26.79%
	+3 ft. MLLW	0.00%	0.00%	0.07%	0.46%	10.82%	36.55%	41.67%	7.81%	2.62%
2	-2 ft. MLLW	0.00%	0.00%	1.06%	0.08%	2.93%	1.27%	3.31%	1.15%	90.20%
	+1 ft. MLLW	0.00%	0.24%	0.12%	0.67%	4.39%	4.39%	14.36%	5.34%	70.50%
	+3 ft. MLLW	0.00%	0.27%	0.00%	1.38%	12.73%	18.21%	19.74%	7.79%	39.87%
3	-2 ft. MLLW	0.00%	0.80%	0.21%	0.96%	25.80%	19.87%	34.51%	5.07%	12.77%
	+1 ft. MLLW	0.00%	0.00%	0.00%	1.03%	17.99%	42.77%	20.99%	1.29%	15.93%
	+3 ft. MLLW	0.00%	0.47%	0.52%	2.22%	18.93%	36.68%	35.84%	4.59%	0.42%
4	-2 ft. MLLW	0.00%	0.13%	0.00%	0.56%	8.10%	30.94%	25.65%	4.40%	30.21%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.13%	14.95%	42.14%	26.76%	3.04%	12.98%
	+3 ft. MLLW	0.00%	0.03%	0.00%	0.00%	3.33%	12.85%	8.14%	7.39%	68.26%
5	-2 ft. MLLW	0.00%	0.00%	0.58%	1.97%	37.79%	40.22%	17.76%	0.74%	0.95%
	+1 ft. MLLW	0.00%	0.00%	0.00%	27.30%	3.41%	42.54%	24.72%	2.03%	0.00%
	+3 ft. MLLW	0.00%	0.12%	0.18%	1.05%	22.23%	19.77%	14.66%	2.28%	39.71%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (October 1999).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	0.00%	2.20%	2.89%	2.89%	6.19%	5.16%	11.15%	6.61%	62.90%
	+1 ft. MLLW	0.00%	0.96%	1.27%	1.57%	5.42%	14.61%	29.58%	6.78%	39.88%
	+3 ft. MLLW	0.00%	1.68%	1.60%	2.88%	19.17%	35.34%	34.42%	4.59%	0.32%
2	-2 ft. MLLW	0.00%	3.23%	3.08%	3.23%	5.38%	6.54%	10.92%	6.54%	61.08%
	+1 ft. MLLW	6.04%	5.10%	2.49%	2.61%	5.60%	4.04%	9.46%	7.16%	57.50%
	+3 ft. MLLW	1.59%	1.45%	2.36%	4.79%	41.50%	10.96%	13.56%	4.89%	18.89%
3	-2 ft. MLLW	0.00%	1.91%	1.82%	1.91%	5.45%	20.23%	29.64%	7.95%	31.09%
	+1 ft. MLLW	0.00%	1.02%	1.28%	3.26%	20.79%	45.59%	21.18%	2.08%	4.80%
	+3 ft. MLLW	0.00%	1.42%	1.86%	4.07%	23.03%	43.18%	23.56%	2.88%	0.00%
4	-2 ft. MLLW	0.00%	0.74%	0.53%	0.91%	26.36%	35.76%	18.84%	2.72%	14.13%
	+1 ft. MLLW	0.00%	1.90%	2.49%	1.90%	12.98%	36.46%	0.71%	6.22%	37.34%
	+3 ft. MLLW	0.00%	3.07%	2.36%	2.48%	2.95%	4.42%	4.83%	5.01%	74.88%
5	-2 ft. MLLW	0.00%	0.87%	0.81%	2.49%	35.98%	41.53%	16.29%	2.03%	0.00%
	+1 ft. MLLW	0.00%	1.04%	0.74%	1.28%	2.47%	21.86%	34.88%	37.72%	0.00%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.00%	36.31%	35.46%	22.46%	5.60%	0.00%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (January 2001).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	0.00%	0.61%	1.23%	1.23%	0.61%	4.29%	7.98%	9.82%	74.23%
	+1 ft. MLLW	1.32%	1.32%	1.32%	1.32%	1.32%	7.95%	13.25%	8.61%	63.58%
	+3 ft. MLLW	0.00%	0.04%	0.80%	2.79%	24.69%	33.85%	35.05%	2.79%	0.00%
2	-2 ft. MLLW	0.00%	0.47%	0.47%	2.35%	5.16%	12.68%	11.74%	4.69%	62.44%
	+1 ft. MLLW	0.00%	0.52%	0.52%	1.03%	0.52%	12.37%	7.73%	21.13%	56.19%
	+3 ft. MLLW	0.00%	1.44%	1.44%	3.85%	12.98%	16.83%	20.67%	4.33%	38.46%
3	-2 ft. MLLW	0.00%	0.54%	1.08%	1.61%	9.68%	51.61%	13.44%	1.08%	20.97%
	+1 ft. MLLW	0.00%	0.59%	0.88%	1.18%	10.00%	30.29%	37.06%	1.18%	18.82%
	+3 ft. MLLW	0.00%	0.77%	0.77%	2.30%	31.80%	36.78%	26.05%	1.53%	0.00%
4	-2 ft. MLLW	0.00%	0.65%	0.65%	0.65%	6.80%	20.39%	29.45%	5.83%	35.60%
	+1 ft. MLLW	0.00%	0.48%	0.16%	0.48%	13.16%	43.02%	30.34%	3.37%	8.99%
	+3 ft. MLLW	0.00%	0.64%	0.32%	0.64%	14.42%	38.78%	27.88%	2.88%	14.42%
5	-2 ft. MLLW	0.00%	0.22%	0.22%	0.44%	1.75%	12.72%	62.28%	16.89%	5.48%
	+1 ft. MLLW	0.00%	0.00%	0.63%	0.85%	2.33%	31.71%	28.75%	33.40%	1.90%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.37%	8.09%	38.60%	47.43%	5.51%	0.00%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (April 2001).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Weight retained (% of total sample)										
1	-2 ft. MLLW	0.00%	2.59%	1.29%	2.16%	5.60%	10.34%	12.50%	3.02%	62.50%
	+1 ft. MLLW	2.10%	2.10%	2.10%	1.40%	8.39%	34.97%	20.28%	4.90%	23.78%
	+3 ft. MLLW	0.00%	0.68%	0.34%	0.34%	4.76%	40.48%	45.24%	7.82%	0.34%
2	-2 ft. MLLW	1.23%	0.61%	1.23%	1.23%	0.00%	1.84%	4.91%	3.68%	85.28%
	+1 ft. MLLW	0.00%	2.10%	0.70%	0.70%	0.00%	3.50%	13.99%	3.50%	75.52%
	+3 ft. MLLW	0.65%	0.32%	0.32%	1.94%	4.52%	30.32%	46.45%	7.10%	8.39%
3	-2 ft. MLLW	0.00%	1.08%	0.72%	1.08%	15.16%	34.66%	37.91%	4.33%	5.05%
	+1 ft. MLLW	0.00%	0.33%	0.65%	2.29%	25.82%	40.20%	21.57%	7.19%	1.96%
	+3 ft. MLLW	0.00%	0.38%	1.15%	3.07%	22.99%	41.76%	26.05%	1.92%	2.68%
4	-2 ft. MLLW	0.00%	0.93%	0.47%	0.47%	9.77%	23.26%	26.98%	4.65%	33.02%
	+1 ft. MLLW	0.00%	0.45%	0.45%	0.45%	9.05%	30.32%	32.58%	8.14%	18.55%
	+3 ft. MLLW	0.00%	0.54%	0.27%	0.27%	15.45%	45.53%	23.58%	1.08%	13.28%
5	-2 ft. MLLW	0.00%	0.00%	0.00%	0.20%	6.94%	56.55%	33.73%	1.98%	0.60%
	+1 ft. MLLW	0.00%	0.66%	0.99%	6.60%	33.99%	32.01%	20.13%	3.30%	2.31%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.64%	3.83%	33.55%	52.72%	8.31%	0.96%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (July 2001).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	0.32%	0.32%	1.61%	0.48%	12.52%	28.89%	25.36%	2.73%	27.77%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.46%	16.06%	ND	77.98%	4.59%	1.38%
	+3 ft. MLLW	0.00%	5.00%	5.00%	5.00%	40.00%	10.00%	15.00%	5.00%	15.00%
2	-2 ft. MLLW	2.15%	2.39%	2.87%	5.50%	28.47%	16.51%	8.61%	0.96%	32.54%
	+1 ft. MLLW	3.01%	0.75%	0.75%	0.75%	0.00%	7.52%	7.52%	0.75%	78.95%
	+3 ft. MLLW	1.75%	2.81%	3.16%	7.02%	17.89%	17.19%	14.04%	9.82%	26.32%
3	-2 ft. MLLW	1.26%	0.63%	1.05%	4.62%	21.01%	41.81%	19.75%	2.10%	7.77%
	+1 ft. MLLW	0.87%	0.87%	0.87%	6.69%	37.79%	31.40%	13.95%	0.58%	6.98%
	+3 ft. MLLW	3.36%	1.12%	1.12%	1.12%	18.66%	49.25%	18.28%	0.75%	6.34%
4	-2 ft. MLLW	1.32%	0.22%	0.44%	0.66%	8.55%	37.06%	19.74%	4.17%	27.85%
	+1 ft. MLLW	0.00%	0.54%	0.27%	0.82%	15.49%	47.55%	20.11%	2.17%	13.04%
	+3 ft. MLLW	0.00%	0.00%	0.37%	0.37%	0.37%	2.93%	5.13%	0.00%	90.84%
5	-2 ft. MLLW	0.00%	0.48%	0.97%	2.66%	18.64%	40.92%	19.61%	2.18%	14.53%
	+1 ft. MLLW	0.00%	0.00%	0.00%	0.55%	2.73%	34.43%	54.10%	7.65%	0.55%
	+3 ft. MLLW	0.00%	0.40%	0.00%	0.81%	7.26%	29.03%	54.44%	8.06%	0.00%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (October 2001).

Station	Elevation	SAND							SILT	CLAY
		Coarse	Medium			Fine				
		U.S. Standard Sieve Size								
		10	20	30	40	60	80	140	200	Pan
Station		Weight retained (% of total sample)								
1	-2 ft. MLLW	0.00%	0.31%	0.31%	0.00%	0.93%	0.31%	61.73%	4.63%	31.79%
	+1 ft. MLLW	0.67%	2.01%	1.00%	1.67%	10.03%	12.71%	26.76%	9.70%	35.45%
	+3 ft. MLLW	0.00%	1.06%	0.80%	2.39%	35.01%	26.53%	18.30%	2.65%	13.26%
2	-2 ft. MLLW	0.00%	0.57%	0.57%	0.57%	0.28%	1.71%	33.62%	28.77%	33.90%
	+1 ft. MLLW	0.00%	0.00%	1.05%	1.75%	5.94%	10.14%	9.79%	30.42%	40.91%
	+3 ft. MLLW	0.00%	1.22%	0.61%	4.57%	23.48%	20.43%	27.74%	5.49%	16.46%
3	-2 ft. MLLW	0.00%	0.00%	0.24%	0.71%	9.48%	31.28%	24.64%	2.37%	31.28%
	+1 ft. MLLW	0.00%	0.34%	0.85%	3.39%	50.85%	30.17%	10.34%	0.68%	3.39%
	+3 ft. MLLW	0.00%	1.22%	0.61%	4.57%	23.48%	20.43%	27.74%	5.49%	16.46%
4	-2 ft. MLLW	3.99%	0.66%	0.33%	0.66%	5.98%	50.17%	16.61%	5.32%	16.28%
	+1 ft. MLLW	0.60%	1.80%	0.30%	0.60%	28.83%	41.44%	20.72%	1.50%	4.20%
	+3 ft. MLLW	0.00%	2.61%	0.37%	0.75%	8.58%	19.78%	11.57%	3.73%	52.24%
5	-2 ft. MLLW	0.00%	0.00%	0.00%	0.00%	16.47%	58.53%	21.47%	3.53%	0.00%
	+1 ft. MLLW	0.00%	0.00%	1.44%	1.44%	18.66%	20.57%	17.70%	5.26%	34.45%
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.00%	0.32%	63.11%	21.68%	12.94%	1.94%

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (January 2006).

		SAND							SILT CLAY							
		Coarse	Medium		Fine											
		U.S. Standard Sieve Size														
Station	Elevation	Weight retained (% of total sample)														
1	-2 ft. MLLW	0.00%	0.00%	0.29%	0.29%	3.47%	5.20%	15.03%	11.56%	64.16%						
	+1 ft. MLLW	1.86%	4.20%	2.56%	2.56%	3.96%	7.93%	12.59%	10.49%	53.85%						
	+3 ft. MLLW	4.08%	8.05%	3.87%	0.52%	15.05%	35.74%	25.81%	3.45%	3.45%						
2	-2 ft. MLLW	1.37%	0.17%	0.17%	0.17%	3.44%	9.45%	18.56%	4.98%	61.68%						
	+1 ft. MLLW	0.00%	1.46%	0.42%	1.04%	1.87%	3.33%	7.69%	3.53%	80.67%						
	+3 ft. MLLW	1.10%	2.03%	1.66%	5.71%	17.31%	14.18%	19.34%	6.08%	32.78%						
3	-2 ft. MLLW	1.48%	0.13%	0.54%	1.75%	19.97%	37.65%	21.32%	4.59%	12.55%						
	+1 ft. MLLW	0.00%	0.00%	0.47%	3.76%	29.96%	40.78%	20.80%	2.00%	2.23%						
	+3 ft. MLLW	1.74%	1.90%	1.58%	2.38%	16.64%	33.91%	31.38%	4.44%	6.02%						
4	-2 ft. MLLW	0.37%	0.12%	0.73%	1.22%	10.49%	23.90%	41.59%	12.32%	9.27%						
	+1 ft. MLLW	0.00%	0.00%	0.12%	0.58%	22.39%	46.75%	25.52%	2.20%	2.44%						
	+3 ft. MLLW	0.00%	1.31%	1.44%	1.44%	7.48%	8.66%	14.83%	4.86%	59.97%						
5	-2 ft. MLLW	0.00%	0.00%	0.56%	1.12%	9.08%	32.68%	52.81%	3.75%	0.00%						
	+1 ft. MLLW	0.00%	1.66%	1.45%	6.33%	38.17%	30.19%	17.01%	2.70%	2.49%						
	+3 ft. MLLW	0.47%	0.00%	0.00%	0.00%	3.46%	20.91%	64.31%	10.85%	0.00%						

Appendix A8-2. Sediment grain size analysis by elevation at five benthic stations (October 2006).

		SAND								SILT CLAY				
		Coarse	Medium			Fine								
		U.S. Standard Sieve Size												
Station		Elevation		Weight retained (% of total sample)										
1	-2 ft. MLLW	1.47%	0.88%	0.29%	0.29%	2.05%	4.11%	7.92%	3.81%	79.18%				
	+1 ft. MLLW	1.69%	0.84%	0.70%	1.97%	17.61%	25.77%	30.42%	4.08%	12.82%				
	+3 ft. MLLW	0.51%	0.13%	0.00%	0.00%	1.41%	3.73%	47.17%	22.88%	22.62%				
2	-2 ft. MLLW	1.64%	1.65%	0.82%	1.64%	5.21%	6.30%	14.52%	8.22%	56.99%				
	+1 ft. MLLW	2.03%	0.61%	0.41%	1.22%	7.30%	7.71%	10.55%	5.48%	60.85%				
	+3 ft. MLLW	1.53%	1.17%	0.82%	3.42%	16.49%	21.67%	23.91%	7.66%	19.55%				
3	-2 ft. MLLW	0.56%	2.25%	2.12%	2.26%	27.08%	30.75%	21.02%	3.95%	9.31%				
	+1 ft. MLLW	0.34%	2.04%	1.47%	4.07%	29.72%	37.51%	15.37%	2.49%	7.01%				
	+3 ft. MLLW	0.00%	0.19%	0.78%	2.92%	37.35%	37.55%	19.84%	1.36%	0.00%				
4	-2 ft. MLLW	0.11%	0.11%	0.00%	0.22%	9.10%	27.75%	44.61%	5.51%	9.44%				
	+1 ft. MLLW	0.00%	0.60%	0.15%	1.04%	29.66%	40.69%	19.37%	2.24%	6.26%				
	+3 ft. MLLW	1.60%	0.80%	0.20%	0.20%	2.20%	6.40%	5.60%	2.00%	80.40%				
5	-2 ft. MLLW	0.00%	0.00%	0.10%	0.98%	13.28%	24.36%	50.49%	8.45%	2.36%				
	+1 ft. MLLW	0.00%	0.00%	0.28%	1.71%	19.52%	30.91%	39.89%	4.84%	2.85%				
	+3 ft. MLLW	0.00%	0.00%	0.00%	0.00%	1.19%	19.44%	70.37%	8.99%	0.00%				